INTERNATIONAL SCIENCE NEWS & INSA DELEGATION REPORTS

Volume 5 Number 2 April 1987

INDIAN NATIONAL
SCIENCE ACADEMY
BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002

International Science News & INSA Delegation Reports

Editors of Publications : Professor V L Chopra
: Professor D V S Jain

Associate Editor : Dr M Dhara

Edited and Compiled by
Scientific Officer (I & L) : Dr Alok K Moitra

© Indian National Science Academy, New Delhi.

Published by the Executive Secretary, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110002 and Printed by him at Leipzig Press, D-52, South Extension, Part I, New Delhi.

XXVI COSPAR MEETING : A REPORT*

The XXVI COSPAR meeting was held at Toulouse, France from June 30 to July 12, 1986. About 30 Indian scientists participated. The following write-up which brings out the highlights of this important scientific event is based on the reports of Professor Sukumar Biswas and Dr S Sampath.

Open Plenary

The Open Plenary session which marks the beginning of the activities, started with the introductory remarks by Professor C De Jaegar, President COSPAR. After this, homage was paid to deceased members of the COSPAR community. Rich tributes were paid to the late Professor K R Ramanathan, Founder Director, Physical Research Laboratory, Ahmedabad, to the crew members of the Space Shuttle Challenger and to a number of other eminent scientists.

After this, representatives of invited international organizations gave short but informative speeches summing up the activities in the various fields.

(*a*) *International Council of Scientific Unions* (ICSU)–Dr R M West.

The important role played by space in remote sensing was stressed by Dr West. Global environmental changes due to both natural and man-made causes need a careful study and the role of COSPAR in such studies was emphasized by Dr West.

(*b*) *Scientific Committee on Solar-Terrestrial Physics* (SCOSTEP)–Professor J G Roederer.

Professor Roederer felt that SCOSTEP functions as a bond between COSPAR and other International Scientific Unions such as ICSU/IAU/URSI/IUGG. In the light of satellites becoming major platforms of observation, he stressed that it becomes necessary to study the atmosphere more rigorously. This is necessitated as satellite orbits are affected by trapped radiations, heating and other aeronomic phenomena. He pointed out that SCOSTEP has successfully carried out two international programmes : MAP (Middle Atmospheric Programme) and SMY (Solar Maximum Year).

He added that major efforts are on to plan long and short term programmes for the next decade. The International Geosphere-Biosphere Programme (IGBP) and Solar Terrestrial Energy Programme (STEP) are two such programmes.

---

* Based on the delegation report of Professor Sukumar Biswas, Senior Professor, TIFR, Bombay and Dr S Sampath, Centre for Earth Science Studies, Trivandrum.

(c) *Scientific Committee on Antarctic Research (SCAR)*-Dr M J Rycroft.

Dr Rycroft pointed out the similarities between Antarctic and Space Research. They are : both have a UN treaty; both have hostile environments and are expensive to investigate and they involve a wide range of scientific disciplines. He also pointed out that COSPAR and SCAR would plan for a low altitude (a few hundred kms.) polar orbiting remote sensing satellite using both active and passive techniques in the electromagnetic spectrum. The areas of application are geology (mineral resources), geodesy, cartography, glaciology (movement of icebergs) altimetry survey, (change in mean sea level due to change in antarctic ice mass), oceanography, sea surface temperature, ocean currents etc.

There were also brief presentations by Dr R M Bonnett representing *European Space Agency* (ESA), Professor G E Muller for *International Academy of Astronautics* (IAA) and Professor L Perek for *International Astronautical Federation* (IAF).

Following this, the National representatives of India (Professor R R Daniel) and Pakistan (Dr M Shafi Ahmed) highlighted the activities in their respective countries.

Professor Daniel spoke about the nationally coordinated Indian Middle Atmosphere Programme (IMAP) which has carried out a number of rocket and balloon experiments apart from ground-based experiments. The continuation of IMAP as IMAP-C for 3 years (1985-88) in conformity with the international programme was also pointed out by him. The successful spacelab experiment 'Anuradha' to measure low energy cosmic rays was highlighted. The plan to establish a MST Radar, a 150 kg Satellite experiment to study gamma ray bursts and satellite experiments to study atmospheric dynamics were out lined. The setting up of a high altitude observatory in the Himalayas and long term planning in space science for the century were also presented.

Dr Shafi Ahmed said that a satellite ground station being set up at Islamabad will be operational in the early 1987 and will receive Landsat and SPOT data. Already about 50 agencies are involved in the applications of remote sensed data to study the siltation of dams, desertification, land use and coastal management. Studies in Aeronomy, geomagnetism and atmospheric pollution are being made. It is planned to have a domestic communication satellite during the seventh 5 yeard evelopment programme 1988-1993. Peaceful application of space technology was also mentioned.

The open plenary came to an end with the presentation of COSPAR Award. *1986 COSPAR Award* was given posthumously to Professor Biermann for his outstanding contributions in the field of *Comets and Solar System Plasma Physics*. The award was presented by the President, COSPAR to Mrs Biermann.

Opening Ceremony

After the open plenary session, the opening ceremony was conducted. Professor JJ Denisse (representative, French Academy of Sciences), Professor B Hultqvist (Chairman, SCOSTEP Programme Committee), Professor G De Jaegar (President, COSPAR) and Dr A A Abiodun (UN Representative) addressed the meeting. Mention was made that China is still not a member of COSPAR and also about the rich contributions made in the fields of Space research by the two Asian countries, India and Japan.

At the end of the opening ceremony, the *COSPAR International Cooperation Medal* was awarded. This was given for the Halley watch programme and awarded to four national space agencies : ESA (European Space Agency), ISAS (Institute of Space and Aeronautical Science, Japan), NASA (National Aeronautics and Space Administration, USA) and Inter COSMOS (USSR). Representatives of these organisations collected the medals from the President, COSPAR.

Symposia

(*a*) *International Symposium on Solar Terrestrial Physics* (ISTP)

The sessions were divided into five main categories such as (a) Sun and Heliosphere (b) Interplanetary medium, (c) Magnetosphere—Ionosphere system and (d) Thermosphere and (e) Middle atmosphere. The ISTP symposium began with Sun and Heliosphere session and with Melrose (Sydney) giving a critical review of solar radio bursts with special reference to particle acceleration. Melrose listed nine types of solar radio bursts currently identified in place of four in earlier decade and concluded from their studies that the older idea of two stage acceleration is inadequate and there are four major stages of acceleration, such as bulk acceleration, stochastic acceleration, diffusive shock and shock front acceleration. Of these the first phase is most difficult to understand when electrons in a localised region is accelerated to about 10 KeV, either due to acceleration or heating. Venkatesan (Calgary) in a talk on cosmic ray variations in 3-dimensional heliosphere concluded that present data upto 30° helio latitudes at the high energy cosmic ray show similar pattern as in the eceliptic plane. Delache (Nice) in a talk on the internal structure of the Sun, indicated that helioseismology model do not provide yet unambiguous answers to the important question as the degree of mixing in the central region or the rotation rate of the deep core. Future projects such as Galium neutrino experiment of 30 tons of natural Galium in deep underground is expected to produce 1 neutrino capture event/day from ^{71}Ga, and thus provide new clues to the current puzzle of solar neutrino flux.

In interplanetary medium session the energetic particle acceleration in solar wind was discussed by Sanderson (Noordwijk) particularly from ISEE-3/ICE spacecraft and Bhonsle (Ahmedabad) presented three dimensional structure of the solar wind from radio scintillation studies.

In the magnetosphere-Ionosphere system session, Gloeckler (Maryland) reviewed the AMPTE ion composition results. He concluded that in the magnetosphere the relative abundances of solar wind heavy ions in the magneto-seath and in ring current are similar to solar wind and the energy spectra are similar in energy/charge both during quiet and storm times. Also there was no bias of mass dependence in governing entry, acceleration and transport in the magnetosphere. Ionosphere as source of some particle population in the magnetosphere was reviewed by Chappell (Huntsville).

(*b*) *Symposium on Synopsis of the Solar Maximum Analysis*

This symposium sponsored by SCOSTEP, COSPAR and IAU and was devoted to the synthesis and understanding of the data collected during SMY on the key aspects of solar flares and their coronal and interplanetary consequences. The symposium was divided into sessions of (a) Flare build-up with precursers, and onset with magnetic reconnection, (b) Impulsive phase and energy release processes, (c) gradual phase with recovery and recurrences and (d) coronal and interplanetary phe-no mena. Priest (Scotland) discussed the role of magnetic reconnection for triggering the flare and releasing the magnetic energies. Strongly sheared magnetic field regions were identified as cospatial with majority of flare sites by Hagyard and Smith (MSFC). Kundu (Maryland) presented observational evidences of heating of active region to 5.15×10^6K prior to the onset over time scales of 1 hour or more and of the changes in polarisation in micro waves or changes in the orientation of neutral lines as evidences precursors for the onset of flares. Van Hoven (Irvin) and Hurford (Caltech) presented the precursor studies and their theoretical understanding in terms of accelerating the magnetic reconnection process of flare phenomena. In the study of impulsive phase of flares de Jager (Utrecht) presented results on a well studied high energy solar flare event of 21 May 1984 producing both gamma rays and solar neutrons. He found that the emission source of this high energy flare event is located in the chromosphere, the emission area being a plasma knot of a few hundred km diameter with a temperature of 5×10^8K and magnetic field exceeding 1400 G. It is suggested that difference between an 'average' flare and a 'high energy' one, being that in an average flare, the sources of primary energization is often located above the chromosphere, at about 10,000 km above photosphere from whereb eams of particles stream downward guided by the magnetic field; thus emission site is located at considerably lower level than the acceleration site. In contrast in the high energy event the emission site virtually coincides with area of primary energization site located in chromosphere. The reconnection area has a diameter of about 50 km. Ramaty (Goddard) presented time dependent fluxes, gamma-rays, neutrons and 0.51 MeV annihilation line in the June 3, 1982 event by several spacecrafts and suggested their relationship. Several authors including Strong (Lockheed) and Svestka (Utrecht) discussed new observations of a number of aspects of the gradual phase of solar flares, their spatial and temporal characteristic and their analysis. The problems concerning the coronal and

interplanetary phenomena and their present level of understanding were discussed by Hildner (Boulder) and its was pointed out that in spite of large mass of new observational data on coronal mass ejection (CME) events, the answers to the basic questions of the cause of CME and the triggering and propulsive mechanisms are not yet known. At the end Kundu (Maryland) and Kane (Berkeley) presented rapportouer talks summarising the main results and conclusions presented in this highly successful symposium.

(*c*) *Symposium on Solar Wind Interactions*

This symposium sponsored by SCOSTEP and IAGA and held during July 3 to 9, 1986 covered ten sessions dealing with topics of shocks, magnetic reconnections, mass loading, shocks and comets, magneto-tails, and heliopause. Theoretical and observational aspects of fast shocks in earth's bow shock and interplanetary shocks were discussed by several authors. Magnetic reconnection processes in the magnetosphere are discussed and it is noted that energetic heavy ions in the magnetosphere of 10-100 KeV are energised by magnetic fields reconnection. The new interesting observations reported on the interactions of solar wind with comet Halley and Giocobini-Zinner and the 'mass loading' of solar wind. This process is identified as photo ionization of cometary neutral heavy ions by solar ultraviolet and the heavy ions are picked up by the solar wind flow which are thus mass-loaded. ICE, VEGA and other spacecraft mass-spectrometer studies showed that the outflow of gas from the comet-head interacts with solar wind producing a bow shock and heavy ions from the comet are energized near the shock front and are 'mass loaded' in the solar wind.

(*d*) *The Symposium on UV Space Astronomy and Physical Processes in the Local Interstellar Medium (LISM)*

It was sponsored by COSPAR and IAU. Papers were presented on the new observational and theoretical aspects of local interstellar medium. Axford (Lindau) presented his recent calculations of cosmic ray pressure on the heliospheric boundary and hence obtained the most recent value of the boundary of the helioshock front and local interstellar medium as about 50 AU. It is noted that this should be in the reach of Pioneer 10 space craft in the next five years or so.

(*e*) *Symposium on Latest Results on Venus and Uranus Missions*

It was sponsored by COSPAR, IAU, IUGG and IUGS. Stone (Caltech) presented highlights on Voyager 2 encounter with Uranus on Jannary 24, 1986. During the flyby, 11 scientific team made sequences of observations to study the atmosphere, the rings, the satellites and the magnetosphere of Uranus which is the most remote object in the solar system. Different scientists presented the results obtained on the properties of the rings and of the ring particles, the geological features of the satellites, the nature of the planetary

magnetic field, plasma and trapped radiation and associated plasma and radio waves. New rings called E rings were discovered and a total of 15 satellites were identified. Because of large tilt angle of 60° of the dipole to rotational axis, the Uranus magnetosphere presents unusual structure. In the Uranus magnetosphere strong fluxes of protons and electrons were discovered. Radio mission from Uranus was observed and their characteristics studied.

In the Vega 1 and 2 missions of USSR studies were made of vertical profiles of temperature and pressure of the Venus atmosphere. Two balloons were injected into the Venus atmosphere in June 1985 each floating at about 54 km altitude telemetered *in situ* measured data back to the earth for about two days while traversing one third the way around the planet. The balloon positions were tracked by a network of 20 receiving stations on the earth with very long baseline interferometry and Venus wind data were obtained.

(*f*) *The Symposium on Comets Halley and Giacobini-Zinner*, sponsored by COSPAR, IAU, IAGA was a major event. Sagdeev (USSR) presented the overview of the highly successfully VEGA 1 and VEGA 2 missions of international collaboration organised by the USSR. In this project an unique opportunity was realised when the spacecraft is transferred to Halley's comet as a result of a swingby in the Venusian gravitational field. The VEGA spacecraft consisted of two modules, the entry probe to study Venus and the flyby for the exploration of the Halley's Comet. Vega 1 and 2 flew through the comet head at a nearest distance of 8000-9000 km to the nucleus on March 6 and 9 respectively. Each of these included four optical experiments, five dust experiments and six experiments on neutral gas, plasma and fields. These arrays of instruments provided spectacular data on the Comet Halley. The nucleus was seen for the first time and its size is determined as 14 Km in the long axis and 8 km short axis with rotation period of 53 hrs.

GIOTTO spacecraft of European Space Agency was targeted to Halley's comet and on March 14, 1986 it crossed the coma of Halley, passing the nucleus at a distance as close as 500 km. The size, shape and morphology, of the Halley's nucleus were studied together with the dust, ion compositions and solar wind plasma interactions in excellent manner.

The International Cometary Explorer (ICE) spacecraft of NASA, USA passed through the plasma tail of Comet Giacobini-Zinner (G-Z) on September 11, 1985, and made measurements of dust particles, energetic ions, plasma and magnetic fields during flyby with nearest distance of tail-word approach of 8000 km in a highly successful mission.

Results were presented on the observations by SUISEI and SAKIGAKE spacecrafts of Japan which studied the solar wind, plasma flow and hydrogen coma of Halley. SUISEI had a closest distance of about 150,000 km from the Halley.

(g) *Workshop on Future Planetary Missions* was addressed by Rosenthal (USA), Sagdev (USSR), Bonnet (ESA), and others who stressed the role of international collaborative efforts for suceess of future missions. The future manned mission on Mars exploration in 1990 was proposed as a collaborative effort of USA with other countries.

Workshops

The workshop on the COSPAR International Reference Atmosphere (CIRA) 1986 had presentations on the various atmospheric parameters. Their measurements, variabilities and their comparison with the proposed model were discussed. The highlight was that an international tropical reference atmosphere proposed by Indian scientists is being considered for inclusion in CIRA-1986. The Chinese group presented results from meteorological rocket launchings using the falling sphere technique. Their temperature data is in general agreement with the proposed CIRA-1986 and their temperature profiles with altitude indicated the presense of gravity waves.

Reference models for trace constitutents in the middle atmosphere were proposed. Using satellite and *in situ* measurements, models have been developed for water vapour, ozone, HNO_3, N_2O, CH_4, chlorofluoromethanes, CO_2, stratospheric aerosols etc.

A workshop dealt with the International Reference Ionosphere (IRI). There were three presentations by Indian scientists. The equatorial or geomagnetic anomaly is not restricted only to low latitudes, but extends to mid latitudes during high solar activity. Based on this observation, it was pointed out that low latitude phenomena have to be incorporated in formulating the IRI.

A workshop on *Advanced Balloon Technology* dealt with balloon experiments and methodologies being used for middle atmospheric investigations. The long duration balloon flights conducted in the southern hemisphere to measure stratospheric electric fields were described in detail. These were for the studies of the Electrodynamics of the Middle Atmosphere. Measurements were made at 26 km for periods ranging from 15 to 60 days. The Indian experiments for stratospheric studies, astronomical investigations were also presented.

An informal workshop on the proposed satellite for the exploration of the variability for the atmosphere (eVA) was conducted by Dr Offermann, which dealt with a new experimental system to study short term variability of the atmosphere.

Invited Reviews

Apart from these, each scientific theme of COSPAR had a selected number of reviews or invited talks. Out of these, the following ones were of particular interest, and are highlighted here.

Professor Alfven developed the concept of the 'Plasma Universe'. This is claimed to be an alternative of the 'visual universe' which is based on visual observation. This concept was brought out clearly by explaining the difference in viewing an object, for example a human hand, using visible radiation and X-rays. The knowledge derived from plasma experiments in the laboratory is being applied in the context of magnetospheric phenomena. It is predicted that such knowledge could be applied in astrophysics also. The usefulness of the Plasma Universe model by applying it to a few test cases were also explained.

Professor G Kockarts outlined the thermosphere and the various sources of energy input into it. The thermosphere is mainly driven by the solar EUV energy input. The variability in the thermosphere due to solar EUV changes are investigated using either the $F_{10.7}$ flux or He (1083 nm) intensity as a marker for the EUV input. The magnetic storm or solar wind effects on the thermosphere are studied using either the geomagnetic indices K_p, A_p or the solar wind velocity V. Gravity and tidal waves play an important role in coupling the thermosphere to the lower regions of the atmosphere.

Dr D J Hofmann explained how the atmospheric effects of the El chichon eruption could be studied in detail because of the availability of satellites and the possibility to conduct balloon experiments, apart from ground based investigations. The 1982 eruption of the Mexican volcano El chichon is considered to be a strong event in terms of providing opportunities for testing physical and chemical models of the middle atmosphere. The satellite data showed that the plume remained globally for a considerable time. Nimbus-7 detected the effect of volcano produced SO_2 while measuring ozone. These measurements showed the spreadings from 80° to 140° over 3 days. Experimental data showed large departures of about 25 ozone units in mid latitudes while equatorial sites did not show any reduction. Total ozone deviation showed a definite decrease in 1982, but not much in southern mid latitude. The balloon measurements in US showed aerosol increase and ozone decrease, after the eruption. In total, the effect of volcano eruption on chemical perturbations, aerosol perturbations and ozone reduction have been studied using satellite, balloon and ground based measurements.

Professor SA Bowhill made a forceful presentation on the 'Achievements of the MAP'. He stressed that an important and useful outcome of MAP is the MST radar. The comparison of results from MST radar with the radiosonde measurements of winds in the stratosphere and rocket measurements in the mesosphere has proved this point. In the chemistry of the middle atmosphere, the study of the mesospheric minimum under the CAMP/ESRANGE campaign was fruitful. In the field of ionization while a few Gerdien condenser measurements showed the minimum in ion density around 60 kms, a few others did not. This needs to be sorted out. Satellite measurements of zonally averaged temperature, ozone and water vapour gave useful

results. The middle atmosphere can be considered as a medium for energy transmission, a laboratory for non-linear interactions and a laboratory for chemistry. The energy transmission can be studied using gravity wave saturation, global electric circuit, climate effects and wave-tide interactions. The non-linear interactions such as Rossby waves, Kelvin-Helmboltz instability development, turbulant cascading, gravity wave-wind interactions and Rayleigh-Taylor instability developments can be studied. The aerosol & surface chemistry and the solar flare effects give a chemical laboratory for studies.

He also highlighted the lessons from MAP which are very useful : (1) Clear definition of scientific area, (2) Early preparations for national participation, (3) Study groups to define the science, (4) Pre-projects to exercise cooperative efforts, (5) Project structure *not* imposed from above, (6) Activity encourage workshops, (7) Publications must be timely and uniform, (8) Alertness for new techniques, (9) Unite techniques in campaigns, (10) Take advantage of all symposium opportunities and (11) Ensure that all the MAP areas are flourishing.

Professor Bowhill also stated that this venture of MAP has been extended under MAP-C for an additional 3 years 1985-88. It is planned to a have final symposium on MAP in 1988 at Helsinki with COSPAR. A long range programme STEP (Solar Terrestrial Energy Programme) is being worked out for the 1990s.

Professor H. Volland reviewed the electromagnetic coupling between lower and upper atmosphere. He informed that contribution by thunderstorms to global electric circuit is more at low latitudes. The maximum energy released during a thunderstorm is in a.c. especially in the 5-10 KHz range. The d.c. component is very small. He said that a rocket experiment did show direct relation between lightning measurements and high energy electrons (5-100 kev). The important questions to be studied are : Does the electrostatic field of thunderstorm penetrate into the ionosphere/magnetosphere? Is there a leakage of electric current outside the thunderstorm? Professor Volland also described the atmosphere as a transmission line for propagation of electromagnetic waves. The atmospheric dynamo in the E region generates a horizontal electrical field while the thunderstorm field is vertical and their interaction is worth studying, he commented.

Dr H Holzworth reviewed the electric fields in the middle atmosphere. The middle atmospheric environment, the known sources of electric field and the new sources, and new variabilities were discussed. On certain occasions balloon and satellite measurements of electric fields correlate well, especially during aurorae. The high variability of conductivities makes it difficult to map the electric fields. That lightning can trigger the explosive spread-F was also pointed out. The new sources of mesospheric electric fields, which have been detected by a few rocket experiments around 50 to 70 kms, are yet to be proven beyond doubt.

Evening Sessions and Presentations

There were two evening sessions on 'Scientific Space Research : An example of International cooperation for peaceful purposes' and 'Search for extraterrestrial intelligence'. Three evening presentations on 'HERMES', 'SPOT', and 'EURECA' were also arranged. Some of the highlights are :

The United Nations had invited various international organisations, among them COSPAR, to commemorate the International Year of Peace (1986), with specific events. For this, the special evening session was organised by COSPAR in collaboration with the International Academy of Astronautics (IAA). This session was on 'Scientific Space research : An example of International cooperation for peaceful purpose'. The session was scheduled to have two presentations by Professors Yash Pal (India) and H Curien (France). As Professor Yash Pal could not attend the meeting, his paper was read by the organiser Professor J Denisse. Following these presentations, Professor C De Jaegar, Professor J G Roederer, Professor S K Runcorn and Academician RZ Sagdeev participated in a round-table discussion.

In the discussion, it was mentioned that, Space belongs to the Earth, and therefore to all countries on Earth, irrespective of the level of development'. It was pointed out that the space is now literally strewn with satellite debris and this could be termed the "peaceful pollution of space". It was highlighted that developing countries must give their students training in space technology.

HERMES is a space plane being developed by European Space Agency. It can carry 2 to 6 spacionauts and upto 4.5 tons freight. This will be launched by ARIANE-5 launch vehicle into a low-earth orbit. The presentation mainly concentrated on the various developments and concepts of the space plane.

SPOT is a series of remote sensing satellites with high resolution imaging capabilities. The first of the SPOT series has been already launched. The preliminary results of the interpretation of SPOT data for various domains of applications were highlighted.

EURECA is the European Retrievable Carrier, being developed by the European Space Agency. Its major objective is performing material science experiments. The concept of the system, design considerations and development to mission needs were detailed.

Indian Representation in COSPAR Bureau

For the first time two Asian countries, India and Japan, had their representatives elected to the COSPAR Bureau. Professor R R Daniel has become the first member of the COSPAR bureau from India.

Recommendations/Conclusions Arrived at the Conference

There was no formal concluding session to draft recommendations. From the presentations of invited talks, reviews, tutorials and discussions on the contributed papers, the following came up as important points to be considered for future activities.

a) It is recommended to have a final concluding symposium on the Middle Atmosphere Program (MAP), during the next COSPAR meeting to be held in 1988. As the MAP comes to a formal end in 1988, this symposium could discuss the achievements of MAP, highlights of the results obtained and new techniques evolved.

b) Efforts be made to formulate in detail the International Geosphere Biosphere Programme (IGBP) and the Solar Terrestrial Energy Programme (STEP).

c) The MST radar's usefulness has been established. It may be put to use to study all the facets of atmospheric dynamics.

d) In ion density measurements, some experiments have detected a maximum around 60 kms, while some others have not. This discrepancy be sorted out, if necessary with the help of mass spectrometers.

e) Efforts be made to consolidate and publish the COSPAR International Reference Atmosphere-CIRA-1986.

f) The International Reference Ionosphere—IRI be consolidated.

g) The model atmosphere for trace constituents be finalised.

h) It is useful to study the global electric circuit by making measurements of the electrical parameters and their variability.

Major Breakthroughs or Results Reported at the Conference

a) Studies carried out using the MST radar data and their comparison with other standard techniques being used, have established the MST radar as a useful and important tool for the study of atmospheric dynamics: The presentations of results by various groups in the conference have highlighted this point. This is a major result and an achievement of MAP.

b) A comprehensive study of the effect of El chichon volcano eruption on the atmosphere has been presented. This reveals the impact of aerosols injected by the volcano on the atmospheric minor neutral constituents such as ozone and the radiative processes. A few discrepancies between theoretical

predictions of the aerosol effect and the experimental measurements have been pointed out. This is an important study.

c) Consolidation and publication of CIRA—1986 is a major step forward, considering the fact that it will update CIRA—1972.

d) Consolidation of IRI model.

e) Small scale variability in the atmosphere has been presented by various workers. Such measurements have triggered the planning of a satellite to measure these variations using high resolution instruments.

f) The results from long duration balloons and other balloon measurements of conductivities have shown large variability between positive and negative conductivities. These necessitate measurements by a different instrument and if possible with simultaneous aerosol measurements.

g) Interesting results on the study of comets Halley and Giachobini-Zinner were presented. These results mainly concentrated on satellite data.

Possible Impact of the Present Conference on Research Work in India

The conference had discussed a number of topics which are of interest to our research activities. Out of them, Middle Atmospheric studies, Ionosphere—Magnetosphere interactions, Thermospheric studies, model atmospheres and reference ionospheres were of particular importance.

The idea to have a concluding conference for MAP in 1988 gives us an opportunity and time frame to consolidate our results and highlight them. As, IMAP is being carried out in a nationally coordinated manner, the outcome will have a great impact on the international scene.

It is planned to set up a MST radar here. The results presented and discussed in the conference have proved the usefulness and importance of such a radar. This should give us extra impetus to go ahead and establish the radar so that useful studies on the low latitude atmosphere can be carried out.

The consolidation of CIRA—1986 and the efforts to include a tropical reference atmosphere proposed from India are really worth noting. This can enhance our activities in modelling.

The papers presented by our delegates were generally well received. The efforts that have gone into our middle atmosphere programme and the results obtained did make a good impression.

The planning of two international programmes, viz. IGBP and STEP, has been stressed in this conference. This should enable the workers to evolve suitable national programmes in these two areas. These two programmes could form a part of the activities in space research for the coming decade.

XIV INTERNATIONAL CANCER CONGRESS : A REPORT*

Dr S V Bhide participated in the XIV International Cancer Congress at Budapest from August 21-27, 1986 and IX International Meeting on N-Nitroso Compounds from September 1-5, 1986 at Vienna. The congress was inaugurated on 21 August by the Chairman of the Council of the Peoples' Republic of Hungary, in the spacious sports auditorium which accommodated 8000 participants and the invited guests. Besides nursing and clinical topics the research topics covered subjects such as oncogenes, growth factors, hormones and cancer, cancer immunology, membranes, chemotherapy, carcinogenesis, occupational cancer, epidemiology, molecular biology, viral and radiation carcinogenesis, tumour biology and biochemistry etc. Due to several simultaneous sessions one had to select one's own areas of interest and the delegate chose to attend the topics pertaining to chemical carcinogenesis. In this area, two symposia, six round table discussions, six panel discussions and ten poster sessions were held. The subjects covered in these various forums were (1) Molecular mechanism of carcinogenesis, (2) Metabolism of carcinogens, (3) Oncogene expression and hepatocarcinogenesis, (4) Natural and promoter type of carcinogens; (5) Nutrition and cancer, (6) Chemoprevention of cancer, (7) Occupational cancer, (8) Qualitative and quantitative assessment of risk factors, (9) *In vitro* carcinogenesis, (10) Role of N-nitroso compounds in the aetiology of gastric oesophageal cancer.

In the session on Chemoprevention a great deal of work was presented on the role of the retinoids, α-tocopherol and vitamin C which are well acknowledged chemopreventive agents. Some work was also presented on the anticancer effects of metals such as copper. In addition some data were presented on the possible modulatory role of calcium. In the symposium on mechanisms, Dr Rajewski using monoclonal antibodies, presented data on O^6 alkylguanine content in the DNA of target tissues and then elaborated on its implications in defined gene-sequences and subsequently in malignant transformation. Dr Eissigman presented data on the chemically synthesized DNA adduct of alkylating agents. A tetranucleotide containing the adduct was introduced in the genone of a bacterial virus. Genome containing the adduct was introduced into *E. coli*. Approximately, 0.4% of the phage issuing from the cells transfected with the S S genome were mutant. Dr Lindall elaborated the role of alkyl transferases in correcting the altered DNA structure by removing the

---

* Based on the delegation report of Dr (Mrs) S V Bhide, Cancer Research Institute, Tata Memorial Centre, Parel, Bombay-400 012.

altered DNA base. He stated that the properties of alkyl transferases are characterized in cells and organisms turned resistant by treatment with low doses of alkylating agents. In the symposium on 'Metabolism of carcinogens', Dr Bartsch showed the possible involvement of lipid peroxidation in chemical carcinogenesis. He reported that both high fat diet and carcinogen treatment increased lipid peroxidation as measured in terms of ethane exhalation or and chemiluminoscence. The difference between treated and untreated groups persisted months after the cessation of the treatment. Dr Modelus presented data on the catalytic activity of various peroxidases such as lactoperoxidase, uterine peroxidase and myeloperoxidase in the formation of free radicals. He also dealt with the role of hydroperoxidase activity of prostaglandin synthase in biotransformation of carcinogen in reactive molecules. In the session on natural carcinogens the delegate presented the data on betel quid carcinogenicity. Dr Toth presented a brief review on naturally occurring hydrazines in different varieties of mushrooms. He presented data on the characterization of structures of hydrazines in the *Agaritus biosporus*, a commonly consumed variety of edible mushrooms and correlated the structures with the carcinogenic potencies. Dr Hirono from Japan showed that several pyrrolidizine alkaloids isolated from plants used as herbal medicines or foods are carcinogenic. He further showed that diester and cyclic diester type of alkaloids which contain necine, retrohecine and otonecine are strong hepatotoxic and hepatocarcinogenic compounds. Dr Hill in his talk emphasized the role of bacterial flora present in human beings. The major site of bacterial activity capable of producing carcinogens and mutagens is in colon. Thus, they can produce ethionine, a range of volatile phenols, N-nitroso compounds and faecal mutagens.

In the session on the 'Qualitative and Quantitative Assessment of Risk factors Involved in Human Cancer' speakers emphasized on various factors that influence the risks of carcinogens to humans. Dr Matsushima elaborated on the role of various short-term tests in predicting carcinogenicity of chemicals. In the session on 'Occupational Cancer' different speakers brought out the modulatory role of confounding factors namely hygine and personal habits such as smoking. Dr Vainio described the utility of animal studies in detecting the occupational carcinogens.

Studies on hepatocarcinogenesis have always contributed to the basic understanding and characterization of malignant transformation. The two sessions were devoted to this topic and many speakers presented recent work on expression o. proto-oncogene or oncogenes in hepatocarcinogenesis.

Dr Thorgeirson presented data suggesting a causal role of oncogenes in hepatocarcinogenesis. Activated Harvey ras oncogenes have been isolated from a chemically induced hepatoma. This group has also shown that expression of myconcogenes is increased very early i.e. at the focal stage during hepatocarcinogenesis. Dr Pitot used C-DNA probes of GGT, alubmin and proto-oncogenes in a population of cells from GGT positive foci to determine the transcriptional activity of these genes. He

observed that transcription of GGT CDNA is extensive in the focus cells but did not observe increased transcription of protooncogenes in the same cells. He reported that some hepatocarcinomas show increased transcription of prooto–ncogenes while others do not. He suggested that alteration in proto-oncogene expression in the multistage hepatocarcinogenesis probably do not occur at the initiation-promotion stage but may be at the final stage of progression.

In the concluding ceremony of the congress, several eminent personalities were honoured. At this function, Dr Montagnier of Pasteur Institute spoke on *Retroviruses in human pathology with special referece to AIDS*, and Dr Fishchinger talked on *Oncology in 2000 AD*. Both the lectures were very informative and impressive.

Following the Cancer Congress, the delegate proceeded to Vienna on route to Baden, Austria to attend the IX International Meeting on N-Nitroso compounds : Relevance to human cancer. The scientific meeting began with the inaugural address by Dr L Tomatis, Director, International Agency For Research on Cancer. In the 5-day meeting there were 52 oral and 78 poster presentations and no simultaneous sessions were held. The meeting dealt with the following topics : (1) Molecular and biochemical mechanism of carcinogenic N-Nitroso compounds, (2) Metabolism of N-Nitroso compounds and reaction with macromolecules, (3) Metabolism and methods for detection, (4) Biological effects, (5) Molecular dosimetry and function of tobacco and betel nut related carcinogens, (6) Endogenous nitrosation of nitroso compounds in humans, (7) Epidemiological and laboratory studies on formation and exposure.

One noteworthy point of this meeting was that the scientists from the R & D Department of Fertilizer Industry, Cigarette Industry, Alcoholic beverage manufacturing companies etc. attended the meeting to acquaint themselves with the recent developments in the detection and possible reduction of N-nitrosamines in various commercial products.

In the session on the 'Molecular and Biochemical Mechanisms' Dr Archer presented data on the activation of Ha-ras proto-oncogenes in the human cells treated with N-Nitroso compounds *in vitro*. Dr Harris showed that human cells grown *in vitro* activated N-nitrosamines to DNA damaging metabolites such as alkyl diazonium ions and aldehydes. These metabolites even showed the ability to inactivate the DNA-alkyl transferase an enzyme involved in DNA repair process. Dr Swenbetg showed that a quantitative dosimetry of alkylation was possible by using radioimmunoassays in hepatocytes treated with DENA *in vivo*. He further showed that initiation of carcinogenesis in hepatocytes could be quantitated by using O^6–alkyl guanine as a parameter. In the session on 'Metabolism of Nitrosamines' Dr Harrington presented data using a higher mammalian model namely pig. He observed that pig served as a very good model in following the sequence of events after nitrosamine administration.

In the session on 'Molecular Dosimetry and Function of Tobacco and Betel Nut Related Carcinogens'. Dr Hecht described the assay of TSNA—globin adducts in the peripheral blood to measure the exposure to tobacco specific nitrosamines in humans. Dr Brunnemann described the tumorigenicity of snuff used for snuff dipping in USA. When the oral cavities of the rats was swabbed 3 times a day with NNN and NNK, tumours were developed at the site of application. Dr Nair presented the data on *in vivo* nitrosation in the betel quid chewers. He observed that ascorbic acid could not prevent nitrosation in all the betel quid chewers.

In the session on 'Endogenous Nitrosation', Dr Wakabayashi showed that when soy sauce was treated with nitrite, the product formed was direct acting mutagen in Ames test and also in Chinese hamster lung cells. The precursor in the soy sauce was tyramino and B-carboline derivatives. Dr Mirvish showed that nitrosation occurs in the skin of mice exposed to nitrous oxides. He showed the presence of nitrosomethyl aniline in the skin of mice painted with N-methylamine and treated with NO_2. Dr Ohshima in collaboration with difference groups in China, France, Poland, showed the evidence of *in vivo* nitrosation as measured by the assay of nitrasoproline a non-carcinogenic nitroso compound excreted in the urine. The epidemiological data on human population exposed to nitrosamines was presented by Dr Preston Johnson who emphasized that clear evidence for the carcinogenicity of N-Nitro compounds in humans is available in case of tobacco chewers and snuff dippers, where the target tissue i.e. oral cavity is exposed to tobacco specific nitrosamines. Since tobacco users are in millions and the tobacco habit starts at a eary age, the carcinogenicity of tobacco specific nitrosamines in humans is convincing. For other occupational exposures such large numbers are not available as yet.

IAU SYMPOSIUM ON CIRCUMSTELLAR MATTER : A REPORT*

IAU Symposium 122 was held from June 23-27 1986, at Heidelberg, FRG in which 200 delegates from 29 countries participated. There was enormous amount of activity and information exchange in five day scientific sessions in which 20 invited review (IR) talks alongwith the contributed papers (CP) in the form of posters (125) and oral presentation (30) were presented. In this symposium observational aspects of mass loss from premain sequence stars (e.g. T Tauri), late type giant and supergiants, Miras and hot stars (wolf-Rayet stars, O, B stars) were presented and mechanisms for mass loss were discussed. Their ultravoilet, optical, infrared and radio observations were presented and discussed. A brief report on some important presentations in the symposium is given here.

B Baschek (FRG) presented the research activity towards the understanding of circumstellar matter in astronomical institutes in Heidelberg during last fifteen years. The main efforts were to study stars with extended envelopes and their precise astrometric study to understand stellar kinetics and dynamics. The study of molecular clouds and early evolutionary phases of stars (Infrared sources, proto stars, bipolar nebulae, T Tauri, Ae-Be stars) are being carried out to understand the process of star formation. Interstellar medium is continuously enriched by heavy ions due to mass loss from stars. To understand the effect of mass loss in interstellar medium, study of HII regions, giants, supergiants, Miras, planetary nebulae and novae has been taken up. F Shu (USA) discussed theoretical aspects of star formation and its relevance to the circumstellar matter in young stars. The effect of strong stellar wind from a pre-main sequence (PMS) stars and its effect on the environment was discussed. According to him large IR excess in PMS stars is due to reprocessing of stellar light in circumstellar shell. C. Bertout (France) discussed observations vs theory of the circumstellar matter in young low mass stars. Star forming region NGC 7129 was discussed. Radio emission (^{12}CO emission) from young stellar objects (YSO) was discussed. Dynamo process may be important in T Tauri stars for magnetic activity. T Tauri stars are fast rotators compared to MS stars of same spectral type. Martin Cohen (USA) discussed T Tauri stars, radio bipolar nebulae, cometary nebulae. The cometary nebula GL 2999 show high polarization $P \sim 30\%$. He also discussed objects GL 1403 and MWC

* Based on the delegation report of Dr U C Joshi, Physical Research Laboratory, Navrangpura, Ahmedabad-380 009.

349. G A Norman (USA) presented the theory of bipolar flows and jets from young stars, formation of jets and their collimation (magnetised and non-magnetised), stability and related object were discussed. In a poster paper by Nadeau and Bastien (Canada) reported circular polarization in T Tauri stars RY Tau, T Tau and SU Aur with a S/N ratio 5 to 7. In T Tauri stars DG Tau and FU Ori circular polarization was found to be essentially zero. Multiple scattering or scattering by aligned nonspherical grains has suggested to be the cause of circular polarization. One session was devoted to Herbig-Haro (HH) objects. R Mundt (FRG) discussed H_2 line observations at 2 μm and IUE observations and UV variability of HH1 was discussed—CIV 1550 and C III 1909 were found to vary by a factor 4-6 in 4 years time but there was no detectable variability in optical (e.g. OIII 5005). CCD images taken by Mundt and his collaborators often show HH objects associated with jet from an IR source or YSO. According to the proposed model—HH objects are consipicuous part of jet (the bright shock front in the jet) from YSO. J E Dyson (UK) discussed the theory of HH objects—their morphology, kinetic structure and spectra. In a contribued paper (CP) Burke Mindt presented their results on HH 34 based on CCD imaging with Hα filter ($\Delta\lambda$ = 67 Å) and long slit spectroscopy. Main results are—jet size is 0.25 pc (one direction); the characteristic spectra—for jet : low excitation and high density $\Delta\lambda$ = 40 km/sec FWHM; for HH 34—high excitation, low density, $\Delta\lambda$ = 50-60 km/sec. Bohm and Raga (CP) presented bow shock model of HH objects and compared their model with the observations of HH 34. Another important CP was *A jet model of HH objects* by Wilson et al. (UK and FRG). This model explain the knots in jet observed in some HH objects (e.g. HH34). N Evans (USA) presented a CP on *Observations of IR emission lines in PMS objects.* Bracket lines are found to be weaker than predicted for a given mass loss rate. Simon et al. 's model explain the spectra of PMS objects if excess radio emission is ignored, CO measurements over estimate it by an order of magnitude. R J Cohen (UK) in his talk (IR) discussed the circumstellar envelopes of OH-IR sources and B Wolf (FRG) discussed some observations relevent to the theory of extended envelopes. In a poster paper by Lenzen (FRG) presented deep 1 μm CCD exposures and polarization for sources GL 2884=S140/IRS; GL 2789 = V645 Cyg., GL 2591 and L 1551/IRS 5 embedded in molecular clouds. All these objects are surrounded by diffuse emission regions. Lumious compact reflection nebulae are very near to the central illuminating IR sources which are always situated with the axis of molecular outflow. The polarization maps show centro-symmetric pattern of polarization vectors typical of reflection nebulae. The position of illuminating sources defined by this directional pattern coincide with the positions of IR sources. The dust distribution is deduced to be strongly anisotropic and very high extinction values are found with the line of sight to the central source whereas there is very little extinction in the direction of mass loss. J Linskey (USA) discussed the mass loss of late type stars as a function of position in HR diagram. He discussed various conditions for thermally driven wind, radiatively driven wind or wave driven wind. He suggested that high spatial

resolution heterodyne interferometric measurements at 10 μm are most important for understanding mass loss phenomenon in these stars. D Reimers (FRG) discussed the mass loss in binary systems. The mass loss in these objects range in $\sim 1 \times 10^{-7} - 10^{-5}$ M_0/yr. H Lamers (Netherlands) discussed the observations of winds and circumstellar matter in hot star, viz. normal OB stars, WR stars, luminous blue variables and Be stars and found that UV spectra indicate the mass loss decreases from O to B stars. He discussed mainly the case of WR stars, which generally have large mass loss rate. IRAS data indicate the presence of hot dust ($T_d \sim 1000$K) around these stars. Silicate features at 9.7 μm are also present. Spectra also indicate the presence of cool material far away from the star. Characteristics of dust shell are $-1/\lambda$ emissivity law and optically thin in most cases. Dust is being formed continuously at a particular distance. A G Hearn (Netherlands) discussed theory of winds from hot stars specially Be stars. P Judge (UK) in his CP presented emperical data of K & M giants based on IUE data. His finding shows that UV flux is generated near the star and there is no evidence of material flow with V_{esc}. In another CP, Kurt (USSR) suggested to explain large mass loss rate in late type giants. Kafatos (USA) presented CP on jets in symbiotic stars. In another CP, he discussed the R-Aquarii jet. There are clump of material at different p.a. near R-Aquarii, which emit in radio region. Either the eruptive nature of mass loss or the precessional motion of jet have been suggested to explain this kind of spatial distribution of matter.

Stencel (USA) discussed in the invited review the NASA's plans relevent to the study of circumstellar matter. Rationale behind NASA plans are—wide wavelength coverage, high angular and temporal resolution. Initially NASA plans for sky survey followed by detailed survey or source study specialised follow-up. They also plan to conduct experiment to study dust nucleation processes and microgravity experiment. Nuth (USA) presented experimental studies of grains in the laboratory. They studied half life of $Si_2 O_3$ at various temperature conditions in the laboratory and have deduced a relationship $K = 19^9 \times \exp(-20{,}000/T)$ hour for the time constant.

Contribution of the Delegate

Three contributed papers in the form of posters were presented. The special discussion points were the following : (i) In case of R-Aqr system, the precessional motion of "jet" suggested for the first time was discussed and this could be an important mechanism to understand the formation of radio sources very close to R-Aqr but at different position angles. (ii) For the understanding of geometry of circumstellar matter in T Tauri stars, the monitoring of polarization in optical region in different phases is very important. This point was discussed and polarimetric observation of T Tauri stars will be continued from India. High spatial resolution observations are badly needed and should be pursued in near future.

Recommendations/conclusions arrived at the conference

High spatial resolution observations of bipolar nebulae and 'jets' are required and must be taken up in near future. There were recommendations to make observations either from space telescope or special interferometric observations from ground based observatories in near infrared region to achieve high spatial resolution. These observations will be useful to understand the mechanism(s) of mass loss processes in the star.

Major breakthroughs or results reported at the conference.

Many important results were presented and discussed in the conference. In the opinion of the delegate the major breakthrough is in the understanding of bipolar flow and 'jet' formation and the questions related with the stability of jet. The knots predicted theoretically along the 'jet' were observationally confirmed. In case of jet responsible for the formation of HH 34 shows structure with knots.

Possible impact of the present conference on research work in India

(i) The Physical Research Laboratory has already started polarization measurement programme in the optical region of stellar and galactic objects. In stellar objects polarization is mainly produced by the circumstellar matter around the star. So for very important results we have been obtained through polarimetric observations of some objects (e.g. R-Aquarii, T Tauri star, F-type supergiants having large IR excess) with circumstellar matter. Some objects need simultaneous (e.g. photometric, polarimetric and spectroscopic) observations in different region of the spectrum to get an integrated and detailed picture. Discussions were held with Professors Lamers, Kafatos, Bastein, Tinbergen on this point. It is proposed to initiate an active international coordinated programme in which Indian scientists will be active participant. This will further accelerate scientific programme in India. Professor Kafatos (JPL-NASA) is very much interested in the work on R-Aquarii system which the delegate's group is engaged with.

(ii) Discussions with Professor Tinbergen and Dr Bastein on the improving the performance of polarimeter were quite useful. Discussions with Professor Tinbergen on CCD based spectropolarimeter are quite useful to initiate the development of such polarimeter in India.

(iii) Dr R Mundt, Max Plank Institute for Astronomy, Heildelberg, FRG, is interested to have collaborative programme on T Tuari stars and bipolar nebula. Once this programme is initiated, this will have very good impact on Indian astronomy.

(iv) The scientific presentations and discussions made in this conference will help to develop new backend instruments for the telescope and subsequently to take up new scientific programme.

The delegate had important discussion with Professor Lamers on the polarization measurements of star HR 4049, made by the delegate's group in March 1986 in India. This star is very peculiar and its IR spectrum has been discussed by Lamers et al, in a paper published in *Astronomy and Astrophysics* 1986. It has been considered important to make polarization observations of some more early type stars, similar to HR 4049, which show large IR excess indicative of massive dust shell around such stars. Professor Lamers has agreed to send the results based on their study of IRAS data for such stars. The polarization observations will be conducted in India.

IAU COLLOQUIUM ON PHYSICS OF BE STARS : A REPORT*

The International Astronomical Union Colloquium No. 92 on 'Physics of Be Stars' held recently at Boulder, Colorado, USA, from August 18-22, 1986 is the third one on Be stars in recent years. The earlier two were held at Cape Cod (USA) and Munich (Germany) in the last decade. There were 80 plus participants and 18 review papers and around 80 poster or contributory papers presented in this Colloquium during the five day conference. Arne Slettebak, Chairman of the Colloquium and T P Snow, Chairman of the Local Organizing Committee welcomed the participants. James Corbridge, Chancellor, University of Colorado in his welcome address emphasized the need for the development of astronomical education in the universities at all levels due to the growing importance of space research activity and requested the higher authorities in various government departments to come forward and allocate more funding for this outstanding science in order to reap the maximum benefits through the frontier research work being done throughout the world. He also emphasized that the universities are the pillars for this frontier research for decades to come and hence more funding should be allocated to the universities in order to attract outstanding talents.

The proceedings of this colloquium could be divided into five different sections. They are :

i) Definitions and Terminology,

ii) The Underlying Stars (Theory and Observations)

iii) The Circumstellar Gas (Theory and Observations)

iv) Evolutionary Status of Be Stars (Theory and Observations)

v) Future Work (Theory and Observations).

G W Collins II reviewed the use of terms and definitions of Be stars and emphasized the need to delete the term 'Extreme Be star' as it complicates and intrudes into the properties of other emission line stellar objects and suggested that the working definition of a Be star should be 'A non-supergiant B-type star, whose spectra has or had at some time shown one or more hydrogen lines in emission'.

---

* Based on the delegation report of Dr G C Kilambi, Centre of Advanced Study in Astronomy, Osmania University, Hyderabad-500 007, AP.

The term 'Pole-on' should be used only if the inclination (i) is less than 30° and the 'equator-on' only if inclination is greater than 60°.

The section on the 'Underlying Stars' was reviewed by A Slettebak, Paul K Barker, John R Perey, J P Cassinelli and Robert C Smith. Slettebak reviewed the various methods for determining masses, radii, luminosities, effective temperatures, spectral types and rotational velocities of the underlying Be stars and has given representative values for each class. Barker reviewed the attempts made to detect magnetic fields in Be stars and pointed out that none was found to have any field eventhough 10 Be stars were observed. The obsered sigma of the longitudinal field (BL) is of the order of 75 to 250 gauss and he emphasized that the detection of longitudinal field depends strongly on the field geometry and orientation. Percy reviewed the short-term photometric and spectroscopic variability of 40 Be stars and showed that the observed time scales are of the order of 0.2 to 2 days. The photometric variability is very small, often irregular and superimposed on long-term variability. The spectroscopic variability is usually observed as absorption-line-profile variability which requires high signal-to noise and high spectral resolution detectors. Because of the high complexity in obtaining the observations, the need for more and accurate intensive studies of these stars in order to evolve a necessary mechanism for this variability was emphasized.

Cassinelli reviewed the nature of rotating stellar atmospheres and emphasized that the rotational velocities derived from UV line-profiles are far smaller than that of the values derived from optical region. In addition, he has pointed out that the derived values of MV and colours are strongly dependent on the inclination of the rotational axis and cautioned that the interpretation of Be phenomenon should be taken only after a broad range of observations are obtained. Smith reviewed the rotating stellar interiors and showed that the rotation has two main quantitative effects on the structure of the star : It distorts the shape and also reduces the total luminosity. The total luminosity depends only on the total angular momentum but the shape and the observable properties, depends on the internal distribution of angular momemtum. The expected distribution even for main sequence stars is an unsolved problem and the redistribution of angular momemtum can occur as a result of large scale circulation currents, instabilities and magnetic stresses. Hence, there may not be any steady state and probably the studies of non-radical oscilations might eventually lead to a direct probing of the internal angular momemtum distribution by the methods now being used to study the internal rotation of the Sun. He has also suggested that differential rotation near the surface would probably give rise to turbulent motions which could generate the mechanical energy flux which seems to be a necessary input to the winds in hot stars.

The observations on circumstellar gas was reviewed by J Dachs. In his review of optical line spectra of classical (non-super-giant, non-peculiar) Be stars, he

compared the high resolution spectral measurements with the existing Be star models and pointed out that the presen tobservational data support a rotating disk model for the cool, line-emitting region ($T \approx 10^4$ K). Emission line profiles are interpreted in terms of geometry, dimension and dynamics of a dense ($N = 10^{11}$ om^{-3}) line emitting region in the circumstellar envelope separated from the thin, hot expanding stellar wind region.

L Houziaux and J Manfroid reviewed the spectral energy distribution and interstellar reddening of Be stars. The energy distribution in the region λ 3700-8500 A is very complicated and cannot be fitted with a single set of values of T_e, log g and E (B-V) due to excess emissions and circumstellar reddening. Houziaux has suggested that the use of UV bump at around 2200 A could lead to some understanding of the circumstellar reddening and thus reduces the problem of interpreting the energy distribution of Be stars.

Infrared observations of Be stars was reviewed by LBFM Waters and emphasized that the present observational data clearly suggest that these stars are surrounded by two regions : (i) very hot ionized region close to the stellar surface and (ii) cool envelope surrounding (i). The emission measure varies with spectral type and some of these stars show an excess of 12μ emission compared to the other systems.

High energy phenomena in Be stars was reviewed by T P Snow with a particular emphasis on superionization and high velocity winds. The appearance of displaced absorption components of resonance lines such as Si IV, C IV an N V which are frequently observed in Be stars and are of variable nature with time, requires either the variation of mass flux or the presence of shocks in the winds of both. A possibility of Be star phenomenon linked with OB star phenomena is put forward on the basis of superionization, discrete components and their variability and soft X-ray emission. X-ray observations of Be stars were reviewed by E P J Vanden Heuval and pointed out that the X-ray binaries constitute the most numerous class of massive binary systems and all Be X-ray binaries have neutron stars often recognized by the presence of regular X-ray pulsation. The strong correlation between the orbital period and pulse period of Be X-ray binaries found by Corbet provides an important new information about the properties of the circumstellar envelopes of Be stars. This demonstrates the importance of neutron star companions as probes for the study of the circumstellar matter around these stars.

J M Marlborough presented the attempts made to understand the structure and dynamics of the circumstellar matter of Be stars in terms of a stellar wind modified or enhanced by rotation. Peter Harmanec, while presenting the binary hypothesis of Be star phenomenon, emphasized that a statistical study based on observational data showed that virtually all emission line binaries are interacting systems. Yet, the question of applying the binary hypothesis to all Be stars cannot be answered at present because of the lack of systematic radical velocity studies.

In recent years many Be stars have been found to atleast occasionally undergo non-radial pulsations. W Baade, in his review of Be stars as non-radial pulsators, suggested that any working model should contain the behaviour of the central star as well as the usually variable circumstellar envelope or extended atmosphere. The present models currently accepted are not fully self-consistant due to the ambiguities in the line profile fittings. This is attributed to the lack of simultaneous observations and the unknown nature of the pulsation eigen functions of rapidly rotating stars, and also the difficulty posed in demonstrating the individual mass loss events to the changes in the pulsation pattern.

V Doazan had presented *the Spheroidal Variable Mass Loss, Decelerated Be Star Model*, where as, A B Underhill had presented Magnetic Model for Be Stars. Even though, Doazan's model is an empirical one based on observational data, yet it suggests an interaction of the mass outflow coupled with the rotation of the star-which need not be critically rotating-producing a departure from spherical symmetry in the Be star atmosphere. The magnetic loop model for a stellar mantle suggested by Underhill not only explains the differences in spectrum and changes of spectrum which are observed for main sequence stars in the range from 2.5×10^4K to 3.0×10^4K, but also indicates that the difference in the spectrum between a shell star like γ Gas when it is in active state and a Wolf-Rayet may be due to a difference in the environment.

Helmut A Abi reviewed the observational aspects of the evolutionary nature of Be stars on the basis of galactic distribution, kinematics, duplicity, the presence of Be stars in clusters and their observed positions on H-R diagram. Robert C Smith discussed the evolutionary calculations of rapidly rotating B-type stars and the effect of rotation on evolution and emphasized that the blurring of main sequence tracks are due to overshooting, rotation and mass-loss and they should be taken into consideration while constructing models for Be stars.

M J Plavec in his concluding remarks on the work on Be stars, emphasized the need for coordinated observations covering a large fraction of the energy distribution curve for a better understanding of the phenomena. In addition, he suggested that a continuous observations of high resolution spectra are needed to know the nature and rate of mass loss and also the structural changes in the envelope. X-ray observations are also useful in detecting the binarity and the nature of the companions. He had urged the theorists to include mass loss, rotation and overshooting in constructing models and also emphasized the need of the distribution of angular momemtum within the system in order to understand large scale circulation currents, instabilities and the role of magnetic field on evolution.

The Delegate's contribution

The delegate had presented a paper on the *Red and Infrared Photometry of Be stars* coauthored by P Vivekananda Rao and M B K Sarma. Photoelectric

observations of around 35 Be stars through Red and Infrared passbands of the Johnson system were presented. The positions of these stars on $[M_v - (V - R)_0]$ and $[M_v - (V - I)_0]$ planes were discussed. A few of these stars have shown very large amplitude of variation when compared with earlier observations whereas the others have remained more or less constant in brightness.

The contribution was well received by other delegates and requested the Indian group to continue observations not only on these stars but also to include other Be stars in order to understand their light variations, periodicity, binarity and nature of the circumstellar envelopes etc. The Chairman of the colloquium has suggested to include or make observations in the far infrared region also in order to understand the evolutionary nature of these stars.

Possible impact of the present Conference on research work in India

The International working groups on Be stars have welcomed the contribution made by the Indian group. The red and Infrared photometry presented extends the observations in the optimal spectral region and gives a clue to the study of time variations of the energy distribution, the nature of the circumstellar emission and its behaviour.

The X-ray emissions observed in some of these stars could lead to the understanding of the production mechanism of X-ray emission, the binarity nature which indirectly help us to understand the nature of the compact companion and its orbital motion through the stellar mantle. It is recommended by various groups to continue further observations of these stars not only through red and infrared photometry but also, through narrow-band interference filters like $H\alpha$, $H\beta$ etc. in order to understand the nature of line emissions and their variability in both short and long time scales. The X-ray satellite which is scheduled to be launched around 1990 by the Indian scientists should include a programme of Be stars to strengthen the understanding of the nature of Be phenomenon.

The conclusions and recommendations made in this conference will certainly widen the horizons of the research in India on Be stars.

Report of technical visits made outside the conference

The delegate had also attended IAU Symposium No. 126 'Harlow-Shapley Symposium on Globular Cluster systems in External Galaxies' held at Centre for Astrophysics, Harvard University, Cambridge (Mass.), USA, from August 25-29, 1986. The symposium was attended by 160 astronomers from all over the world and had deliberations on the nature and evolution of globular cluster systems in our own Galaxy, nearby and distant Galaxies. The highlight of this conference is that the

proposition made and more or less accepted view that there is also a very old population of stars which presumably belong to the first or latter generations of stars with less metallic content in their composition than those stars which belong to Population I or Population II groups. This new group of stars is tentatively termed as Population III group members and seem to occur in the cores of very old globular cluster systems.

Charge Coupled Devices (CCD's) observations of the stellar content in the cores of some distant globular clusters were presented by USA and European groups and the analysis of these observations led to the understanding of density distribution, stellar content and the luminosity function of these systems is another highlight of this symposium.

The delegate also met Dr Robert H Koch (delegate's thesis adviser and an expert on Binary stellar systems), University of Pennsylvania, Philadelphia and had discussions about the on going binary stellar systems research work at Japal-Rangapur Observatory, Hyderabad.

The delegate also met Dr J D Fernie, University of Montreal, Montreal, Canada, an expert on galactic clusters and δ-Scuti systems and discussed about the on-going research projects on these topics at JRO, Hyderabad.

IGCP-IGBA MEETING ON IGNEOUS DATA BASES : A REPORT*

Professor K V Subbarao participated in the International Geological Correlation Programme-IGBA Meeting on Igneous Data Bases which was held at the Middle East Technical University, Ankara, Turkey between June 29 and July 6, 1986. Discussions and formal presentation of papers were channelled during the first half of the programme between 29th June and 3rd July 1986, followed by three days of geological field trips to parts of Central Turkey (July 4-6, 1986).

The Meeting was divided into 5 technical sessions :

Organizational and Business Matters of the IUGS Subcommission

Chairman Felix Chayes (USA) explained the overall responsibilities of the IUGS Subcommission and general management of IGBADAT. He drew attention to the matter of data standards and development of symbolic vocabulary that will permit us to incorporate in the base the published data. N Nishiwaki (Japan) Chairman, Working Group on Sedimentary Petrology presented a comprehensive review of progress on Sedimentary Data Bases and circulated a questionaire for standardizing the sedimentary rock information crucial for the generation of a base. The French and Hungarian groups would be adding more than 5000 rock analyses to the igneous data base covering most of the European countries.

The Kuwait Workshop

Under the auspices of the Subcommission, IGCP 239 and UNESCO, an international workshop on the use of computers in the manipulation of petrological data is scheduled to be held in Kuwait between September 12-23, 1987. The workshop will be largely devoted to the training of geologists in developing countries in computerized methods, particularly on the interfacing of microcomputers with mainframes to access public data bases for use in higher education, petrological research, and resource exploration.

The members of the organizing committee highlighted the detailed plan of course content and hands—on computer instruction : Pedagogic scope and procedures

---

* Based on the delegation report of Professor K V Subbarao, Department of Earth Sciences, Indian Institute of Technology, Powai, Bombay-400 076.

(D Steward, USA), Application in Higher Education (R Clark, USA), and Mineral Industries (J Durham, UK), A Model Research Application (K V Subbarao, India) and The DBMS (F Chayes, USA).

Some general aspects of IGBADAT transfer and utilization

Chairman K V Subbarao highlighted activities of different countries on data capture and transfer. He also reviewed the progress of Indian data base with nearly 4000 analyses and the use of mainframe and microcomputer systems. Russ Clark (USA) shared his recent experiences on the possible role of *Optical Disc* in IGBA and potential usefulness in IGBADAT. John Durham (UK), G Nagy (Hungary) and C Unan (Turkey) presented their national format of IGBA and the progress with the development of subroutines for moving data to international IGBA format.

Portable Subprogrammes for decoding and using copies of or extracts from IGBADAT

Felix chayes gave a detailed account on the development of DECIGB package as well as the experiences of the Kuwait group using this programme. This package is available for use by any interested personnel. Chairman of the 4th Session, Roger Le Maitre (Australia) volunteered to provide CLAIR date base system and several petrological programmes on tapes.

IGBADAT Data transfer by Microcomputer

Chairman Joe Frizado (USA) summarized various activities at the Bowling Green University using Microcomputer Systems including the development of novel PET Program for IGBA data transfer for Apple microcomputer, and DIF format translators for IGBA Data. Russ Clark demonstrated his new data transfer programme using IBM/PC. J Hirson (Brazil) explained the current work on IGBA data transfer in Brazil, particularly using both mainframe and microcomputers.

The post-meeting field excursion trip to parts of Central Turkey. Ankara melange, pillow lavas, granites of Kirsehir Massif, Central Anatolia volcanics and Neogene ignimbritic tuffs provided an excellent opportunity for examining thrust zone between two subtectonic units, and volcanic structures coupled with intense weathering resulting in "Earth pillars".

Summary of the scientific contribution by the delegate

K V Subbarao presented a detailed paper *Software Package as Research tool in Geosciences* under the topic "A Model Research Application" for the proposed Kuwait Workshop. This talk outlines some special features of a set of packages developed by the NSF Project group of IIT, Bombay for earth science studies. The

programme GEONORM enables the user to calculate CIPW norms and various defind variables using major and trace element analyses. Petrological data as well as data regarding sample location can be added on later data as and when such information is available. The programme GEOCOR provides correlation coefficient patterns using major and minor element data for extracting petrogenetic information. This programme is ideally suited for regular use and less expensive to use than the commercial SPSS package. The GEOBAS programme deals with the storage of mass of chemical and petrographic data in one form and retrieve the same in a variety of ways. Several subroutines have been developed to have access to the commercial packages with least effort. Special mention must be made regarding the GEORAO Programme for carrying out Discriminant Analysis.

The highlights of the talk relates to experiences using both mainframe and microcomputer systems at IIT, Bombay *vis-a-vis* the development of software and maintaining chemical data base for the Deccan Basalt Province and applications in higher education and research in geological sciences in the Indian context.

As a member of the working group on Igneous Data Bases and the organizing committee of the Kuwait workshop, Subbarao actively participated in the discussions concerning transfer of chemical data of Indian rocks to the IGBA and development of course curriculum. He also brought out the significance and usefulness of the Deccan data base in the petrogenesis of the Flood Basalt Provinces on a global scale.

Further, Subbarao contributed to a discussion session during the field excursion, relating to Central Anatolia volcanics—Neogene ignimbritic tuffs of Turkey and other related volcanics.

Recommendations/Conclusions arrived at conference

— It was decided to exchange software between individuals during 1986-87, preferably on an IBM compatable format, and participate in the Kuwait Workshop meeting (September 1987) for live demonstration on the terminals.
— To develop mini data banks at various centers on a global scale.

— To have ready access to the IGBA (more than 10,000 analyses) located at the World Data Center, Colorado using both tapes floppies to all participants, at a nominal cost.

— To utilize the data bases both for higher education—research as well as for mineral exploration, to be adaptable in different countries—environments.

— Transfer of new data from different regions particulary from Europe and Asia and update the IGBA at least once in two years.

Possible impact of the present conference on research work in India

One the major impacts may relate to the use of *microcomputer* for Data Base management in university courses particularly (a) demonstrate petrologic concepts and calculations that are commonly taught in the classroom (b) computer graphics (c) methods of interpretation of data using statistical techniques and computer generated maps. Another important potential use may be in the field of mineral exploration, plus development of mini Data Bases as well. Thirdly, the proposed workshop may also generate interest for initiating/embarking on the computer-aided centers in different disciplines of earth sciences.

INTERNATIONAL CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS-86 : A REPORT*

CPEM is one of the world's major international conference in the fields of electro-magnetic metrology and related fundamental constants. CPEM-86 was held at the National Bureau of Standards, Gaithersburg, Maryland, USA. More than 170 papers describing original work on the theory, design, performance and application of electromagnetic standards and measurement techniques were presented in the technical sessions. In addition to this, there were three important talks in special plenary sessions. These were by :

(a) Professor Klaus Von Klitzing (NL) on *Historical Aspects of the Quantum Hall effects,*

(b) Dr Norman F Ramsay *on Quantum Mechanics and Precision Measurement* and

(c) Mr Ian K Harvey on *The Development of the Australian Voltage Standard.*

Special sessions were also held to discuss the expression of measurement uncertainties and the possible assignment of new values for the constant $2e/h$ and h/e^2, which might result in the changing of Laboratory units of voltage and resistance through out the world. The other important sessions held were on the following topics : (a) Precision Physical tests; (b) Power and Frequency measurements; (c) Quantum Hall effect; (d) Microwave measurement; (e) Opto-Electronics; (f) Dielectric & Antenna measurements and fiber optics; (g) Josephson and SI volt; (h) Time and Frequency; (i) Dielectric measurement; (j) Uncertainties; (k) Basic DC Measurements; (l) Resistance/Impedance Measurement, (m) AC Measurements; (n) Six-port Accuracy; (o) Laser Stabilization; (p) Antenna and Field measurement; (q) Lasers; (r) Calibration services and (s) Automated Instrumentation etc.

Summary of the Scientific Contribution by the Delegate

The participant presented the paper on *A Single load microcalorimetric technique with newly designed X-band load for precise measurement of microwave power.* The work described a newly designed X-band calorimetric load of high efficiency greater than 99.9% and the single load microcalorimetric technique for precise

---

* Based on the delegation report of P C Kothari, Scientist, National Physical Laboratory, New Delhi-110 012.

measurement of microwave power. Because of the thin absorbing film used in the load it is shown that the behaviour of the load towards DC and microwave is almost identical. The results of power measurement at two frequencies and their agreement with the power measured with bolometric method are given. The total uncertainty in power measurement reported is $\pm$ 0.17%.

This development of the broad band (X-band) waveguide type calorimetric load has been reported for the first time. This work has been very much appreciated by the top scientists working in this field in different laboratories of the world. Some of the comments given on this work by the scientists working in different laboratories e.g. Electro-Technical Laboratory, Japan; National Bureau of Standards, USA; National Measurement Laboratory, Australia; Royal Signals and Radar Establishment, UK are :

* This work describes an approach to microwave power measurement which offers advantages in terms of achieved uncertainty and simplicity.

* A useful novel concept.

* Very good technical work.

Recommendations/Conclusions arrived at the Conference

Two important panel discussions were held to discuss the expression of measurement uncertainties and the possible assignment of new values for the constants 2e/h and h/e^2 due to discovery of Josephson Hall effect and Quantum Hall effect which might result in the changing of laboratory units of voltage and resistance throughout the world.

i) Discussions were held regarding the recommendations of CIPM for changing the present system of defining measurement uncertainties in terms of random uncertainty and systematic uncertainty to type A and Type B errors. Type A and Type B errors have been defined as :

Type A errors : These are the errors which could be easily computed by statistical methods.

Type B errors : These are the uncertainties which cannot be computed by statistical methods. Some other estimations are required.

ii) Discussions were held on possible changes in defining electrical units due to discovery of Josephon Hall effect and Quantum Hall effect. The advantage will be that the units will be in agreement world wide.

Major Breakthrough or Results Reported at the Conference

In all there were four sessions on *Microwave measurements*. There were two invited talks on *Progress in Development of Six-port Measurement techniques* and *Microwave Measurement challanges* by Dr E Griffin and Dr D Ryting respectively.

(*a*) *Microwave Power Measurement*

Work on a new fundamental standard for the measurement of microwave power have been reported. The method employs an electron beam to measure the strength of an electric field within a microwave cavity. The overall uncertainty reported is less than $\pm$ 1.0% at 95% confidence level of 100 mW.

The use of a two resistor power splitter for comparing power standards shows very low error due to mismatch which results from the unique properties of the splitter. A technique has been reported to further reduce the reflection error and still enable a wide band automatic frequency measurement. A technique has also been described which may be used to determine the magnitude of the reflection coefficient of the power standards. These techniques are capable of reducing the mismatch errors of typically 1 or 2% by an order of magnitude.

(*b*) *Microwave Noise Measurement*

Estimating the noise temperature output of a coaxial noise standard is complicated by the difficulty in determining the losses in the center conductor joints at the bead supports. In the NBS noise standard this problem is pronounced because of the "high" ($\sim$ 6) dielectric constant of the beryllia beads, used for thermally "locking" the center conductor to the outer conductor, require a small diameter (10.8 mm) center conductor through the beads in order to maintain a 50 Ω characteristic impedance. Since it is not possible with this small a diameter to construct mating "shoulders" where the center conductor pieces are screwed together there is a loss that significantly affects the noise temperature of the standard, and must be eliminated or accounted for to maintain the standard's accuracy.

A technique has been reported to determine the magnitude of this loss via swept frequency reflection measurement. Analysis showed a connector loss coefficient of 0.0163 dB/GHz$^{1/2}$, and a loss coefficient for the internal joint of 0.0076 dB/GHz$^{1/2}$. When this internal loss was included in the noise temperature calculation the noise temperature agreed quite well.

A WG-27 electrical noise standard operating at 94GHz and an associated microwave radiometer has been reported. The standard consists of a matched WG-27 termination heated in a fluidised bed. The output waveguide flange is water cooled and is connected to the matched termination by means of a thin wall stainless steel waveguide

which acts as a thermal isolator. The electrical noise at the output flange is calculated from the measured temperature profile and the electrical properties of the components.

A primary broad band coaxial thermal noise standard with the following specifications have been reported :

- Noise temperature : 700 K
- Operating frequency range: 100MHz to 10GHz
- Layout in 7 mm coaxial transmission line
- Output connector compatible to APC-7

(c) *Six port measurement Techniques and Accuracy*

A complete session has been devoted on this important parameter. Some of the important papers reported in this area are as follows :

- Progress in development of six port measurement techniques.
- Error analysis on six port ANA by simulation.
- On-line accuracy assessment for the dual six port ANA-background and theory.
- On-line accuracy assessment for the dual six port ANA-Statistical Methods for random errors.
- On-line accuracy assessment for the dual six port ANA-treatment of systematic errors.
- On-line accuracy assessment for the dual six port ANA-Experimental results.

(*d*) *Other Important Sessions*

The other important sessions held were : Power and Energy measuremets, Quantum Hall effects, Josephson and SI volt, Time and Frequency, Dielectric measurement, Uncertainties, Basic DC measurement, AC measurement, Laser stabilization and Antennas and Field Measurement.

Possible impact of the Present Conference on Research work in India

The international conference on precision electromagnetic measurements is only one of its kind held biannually. In such conferences papers are reported in various aspects measurements which include new concepts for a particular parameter, improvement in the existing techniques, methods of evaluation of uncertainties,

results of intercomparison, new definitions for a particular parameter etc. These various aspects can greatly effect and improve the existing techniques of measurements, being followed in India, the accuracies of various parameters, etc.

In CPEM 86 conference original work on theory, design, performance and application of electromagnetic standards and measurements techniques have been reported. This latest state of art work presented at this conference will be highly benefitial for scientists working in India to decide their future research work and also they will have an idea that at what level is the work being done in the other countries.

Some of the important work reported in our field is :

* A new fundamental standard for the measurement of microwave power using an electron beam.
* Estimation of the noise temperature output of a coaxial noise standard taking into account the losses in the center conductor joints at the bead supports.
* A WG-27 waveguide noise standard operating at 94 GHz.
* Progress in development of six port measurement technique alongwith error analysis.

To give an example the paper on microwave power measurement reported by the delegate using a newly designed load can be adopted by other countries. Similarly the paper reported on microwave power measurement based on electron beam concept can be adopted in India.

XXX INTERNATIONAL CONGRESS OF PHYSIOLOGICAL SCIENCE : A REPORT*

Professor Abdul Aleem participated in the XXX International Congress of Physiological Sciences held at Vancouver, Canada from July 13-19, 1986. The Congress was attended by about 4000 delegates from different parts of the world. There were 65 invited lectures on various topics, covering different areas of physiology by eminent scientists. In addition to this there were symposia and poster session. The organizing committee had also arranged workshops on the teaching of Physiology and scientific film shows. There was also a trade display a scientific and technical equipment, books and journals. All these events made the congress venue a very informative and scientifically stimulating place for physiologist in general and for young physiologists in particular.

Professor D H Hubel from Harvard Medical School delivered the Fenn memorial Lecture on *The Visual Pathways and Perception : Evidence for Distinct Subsystems in Vision.* He described vision as sensory modality consist of various submodalities such as form, colour, movement and depth. It was indicated that centrally visual pathways shows at least three subdivision involved in different distinct aspects of vision. In macaque and squirrel monkey at the level of area 18. These three subdivisions have been demonstrated anatomically by cytochemical techniques. Cells in Pale stripes are concerned with form and orientation. Thin dark stripes are responsible for colour perception while the cells in thick dark stripes of the area 18 are mainly selective for stereoscopic depth and movement. These findings have been well supported physiological, clinical and psychophysical studies.

In a symposium "Generation of rhythmical patterns", Professor Rodolfo R Llina of New York University Medical Centre reported that the neurons from various thalamic nuclei including reticularis nucleus exhibit electrophysiological properties which are encountered in the oscillatory thalmo-cortical functions. He demonstrated that these cells in addition to the usual sodium and potassium conductances also have 1) a low threshold rebound Ca^{++} spike 2) prolonged after hyperpolarization 3) a non-inactivative slow sodium conductance. Llina stated that superposition

---

* Based on the delegation report of Professor Abdul Aleem, Department of Physiology, J N Medical College, AMU, Aligarh-202 001.

of these different conductances provide the thalamic neurons all the required properties which allow them to oscillate at either 6 or 9 cycle/sec. He suggested that thalamus is capable of two basic functions : a) a relay system transmitting sensory and motor information and b) a system capable of including oscillatory behavior as in sleep or in-attentiveness. He was of opinion that these oscillatory properties are partly due to the properties of a membrane of a single cells and partly due to synchronizing inhibition from nucleus reticularis thalami.

In another symposium on "Ultrastructural aspects of muscle contraction" Dr H E Huxley from MRC Laboratory at Cambridge described that synchrotron radiations-a high intensity X-ray source for diffraction experiments has made it possible to study specific alteration in the contractile proteins during muscle contraction. He reported that high time resolution can reveal the earliest structural changes in proteins which can be accounted for by azimuthal movements of the tropomyosin molecule along the actin filament following the binding of Ca^{++} to C subunit of troponin molecule. This is followed by crossbridge formation. He suggested two different states of myosin cross-bridges. He indicated that changes in the shape of myosin head are likely source of contractile force. In another paper Professor T Klakabaysshi of Tokyo University described a new model of actin-myosin interaction. He showed that the portion of actin binding site of SI was located 2 nm to 6 nm from the tip of SI near SHI site. Professor Toshio Yanagida of Osaka University proposed a new model of head movement. He was of opinion that the sliding of crossbridge along actin filament is responsible for force generation and not the cross bridge rotation as envisaged in the crossbridge rotation theory.

Professor G N Ling from Pennsylvania Hospital deliberated on the two divergent views about the physico-chemical properties of the living cell. According to Ling there are two theories which attempt to explain the living state viz: *a)* the membrane theory which attributes the separateness of the living cell from its environment as primarily the property of the cell membrane and its appendages (e.g. pumps); *b)* the second theory is protoplasmic theory, which is also called bulk phase theory. As per this view the entire cell substance is given a central role in this basic function. He reported that the work of A V Hill, L Michaelis, A Huxely and B Katz gave unqualified support to membrane theory and established that the membrane pump theory in fact represented the correct basic concept of the living cell. Ling stated this dominance of membrane theory was due to "ill advised practice initiated by a few key influential scientists, to cite only evidence favouring the membrane pump theory and to ignore other major evidence against it or in favour of other theories". According to Ling there have been many reports contradicting the membrane theory as evidenced in citation index. Ling questioned the existence of Na and pump and stated that Na pump alone would account for 15 to 30 time the energy a frog muscle can have in form of ATP. He proposed the

Association Induction (AI) hypothesis, and showed how this new theory could explain most of the experimental findings. He also talked of evidences which showed that bulk phase theory was never disproved. He suggested that this new theory would open vistas of knowledge and new approaches in cell biology researches.

In a symposium on "sensory transduction", Professor Sachs from Buffalo described that skeletal muscle containion channels which are sensitive to changes in membrane tension. He reported that the channel conductance may not be dependent on tension but the probability of channel being open show exponential increase with the square of tension. Channel inactivation does not depend on time or metabolic energy since it persists in excised patches of membrane. It is also not dependent on Ca^{++}. Sachs proposed a physical model of gatting for the channels. He reported that the elastic energy of stretching the membrane is a free energy which is involved in gatting the channels in the muscle.

Summary of the Scientific Contribution by the Delegate

Influence of rostral and caudal brain stem reticular formation on the single unit activity of the diffuse thalamic system was studied. Stimulation of the rostral brain stem EEG desynchronising structures produced increase in firing and caudal brain stem synchronizing structurers produced decrease in firing of these thalamic neurons. The findings are explained as the possible mechanism by which the brain stem reticular structures influence the cortical neurons.

Following are the salient features of the experimental results of this study :

- HF stimulation of RRF produced desynchronization which outlasted the period of stimulation.
- Stimulation of RRF and LF did not appreciably alter the ongoing EEG.
- Stimulation of CRF at LF produced stimulus bound EEG synchronization.
- HF stimulation of CRF produced EEG desynchronization or no change was observed in EEG.
- Large number of MTh neuron (22) responded to the HF stimulation of RRF. Same trend of change was observed on HF and LF of RRF stimulation.
- Number of MTh neuron which responded to LF stimulation of CRF were higher than the neuron which responded to LF stimulation of RRF. Most of the responsive neurons showed decrease in their firing rate during stimulation.
- Majority of these neurons (8 out of 11) showed the same trend during post-stimulatory period.

— There were 13 neurons which showed significant alteration in the firing only during post-stimulatory period when CRF was stimulated.

— The posterior hypothalamus has desynchronizing influence on EEG (HESS et al. 1954, FELDMAN et al. 1962) and generally it has an excilatory influence on MTh neurons. Preoptico-anterior hypothalamus has synchronizing influence on the EEG and inhibitory effect on MTh neurons (Nauta 1946, Sterman and Clemente 1962). Thus MTh might be a site for integration of various inputs for EEG modulation.

— Increase discharge of MTh neurons is in line with the report of Machne et al. 1955.

— The results also compare favourably with the finding (Purpura et al. 1966) where EPSP's are elicited and IPSP's suppressed in the ventrolateral thalamus on pontine reticular formation stimulation.

— The delegate's findings are not in agreement with the reports of Mancia and coworkers where they showed the predominance of IPSP's on RRF stimulation. This may be due to sampling difference.

— CRF stimulation at LF produced or EPSP-IPSP sequence (Mancia et al. 1974). The intracellular study had provided an important information, however extracellular study was essential to complete the picture regarding the role of Brain stem and MT Hneurons.

Recommendations/Conclusions arrived at the Conference

Professor Andrew Huxley of UK was elected the president of the Council of the International Union of Phys'ological Sciences. He emphasized on interdisciplinary approach in physiology. He also stressed the need if reasonable balance between specialization and spreading one's interests in breadth for the reason of cross-fertilization and developing better understanding of other areas of physiology.

Major Breakthroughs or Results Reported at the Conference

In a symposium on "Comparative aspects and opposite views" Dr K Wang from Texas University described that recent evidence from biochemical, morphological and immunostaining data indicate the existance of two sets of longitudual filaments as integral part of the structure of muscle. One set of cytoskeletal filaments coexists with thick and thin filaments within saccomere which is made up of titin and nebulin. The other set is the longitudinal component of an extensive network of intermediate filaments enveloping the sarcomere. These structure may contribute to elastic properties of muscle and resting tension and compliance.

Dr G H Pollack et al. in another paper showed that sarcomere shortening occur in a stepwise manner. This means that contraction at the sarcomere level takes place in quantal steps, this implies that there steps can occur synchronously over large regions. Y E Goldman opposed this view.

Professor A J deBold of Queen's University, Canada in a symposium "Natriuretic factor" described the historical discovery of Atrial natriuretic factor (ANF) as a major breakthrough in our understanding of the regulation of body fluid volume. It is supposed to play a major role in vasorelexation and in edematous states. In other paper of symposium and poster presentation various aspect of ANF were discussed in detail by differeat workers. It has been shown that many cell in atria contain secretory granules that release their content in response to stritch. Various work showed massive diuresis and natriuresis in rats after the adminstration of atrial homogenate. After this key observation with two year ANF was purified, sequenced and synthesized. Even the CDNA for ANF and the ANF gene in mouse, rat and humans were cloned. Most cells in atria of all mammals including human have this factor. These cell are called cardiocytes. The cells in right atrium are richer in ANF than left atrium. The human ANF peptide is made up of 28 amino-acids specific tissue binding of ANF has been demonstrated in renal glomeruli pituitary and vascular endothelium. Recently some groups have shown the binding sites in brain in rat especially area postrema, nucleus tractus solitarius and the anteroventral thind ventricle. In man, the administration of ANF results in marked increase in diuresis, natriuresis accompanied by decrease in systolic and diastolic blood pressure.

Changes in the electrical potentials across the membrane are mediated by a single class of proteins in the plasma membrane called channels. Conventional intracellular microelectrode can not record current passing through a single channel because of the background noise. This problem was solved by Neher and Sahmann by patch clamp method in 1980. Since then their technique has been used extensively the for ionselectivity and classification of channels.

Nowadays scientists are usings the method control of channel opening and for working out the kinetics of channel opening and closing. In an invited lecture Professor R W Tsien reported that entry of Ca^{++} via voltage dependent Ca^{++} channel is crucial for depolarization and deverse cellular responses like spike initiation, rhythmic firming transmitter release. According to Tsien there are three different types of Ca^{++} channel classified on the basis of their kinetic studies. They are named L,T,N channels. These channels have also been characterized by pharmacological method also. This work is certainly going to bring about change of fundamental nature in our understanding of the electrical properties of excitatble membranes.

Possible impact of the present conference on the research work in India

It is a difficult task to write about the possible general impact of the XXX International Congress of Physiological sciences on the research work in India As one finds oneself in adequate to write about all the different areas of Physiology which were being discussed there in the Congress. Nevertheless one can attempt to indicate the possible direction we can take in India in order to contribute our bit to the world literature of Neurobiology. An idea which strikes ones mind instantaneously after attending to various presentations in the area of neurobiology is the question of approach or strategy in neurosciences. Majority of the papers in the area of Neurobiology in this Congress were reflecting predominant reductimists trend of thinking. Which is certainly an important time tested approach to unreveal the mystries of CNS functioning. Especially if one has to attempt to discover the principals underlying the organization of neuronal networks constituting the large scale neuronal system, subserving high order function. Fnrthermore this approach can also provide us with an information of interfering and intervening with the function of the system and to assess the role of molecular events in various brain functions. But we obviously can not afford to get bogdown by any particular approach and loss sight of other important strategies of understanding the complex brain function. For example emotion language or recognition physiology are the area when this reductionist approach may not solve the problem say by finding out single cellular structure or substance molecule. Here it becomes essential to imply the holistic or system approach to unfold the hidden secrete of higher brain functions. This is an extremely important issue in neurobiology today.

INTERNATIONAL CONGRESS OF ECOLOGY : A REPORT*

The IV International Congress of Ecology was organised for the International Association for Ecology (The Ecology Section of the International Union for Biological Sciences) and was sponsored by the Ecological Society of America. The State University of New York College of Environmental Science and Forestry and Syracuse University, USA. The Cosponsors of the congress were Cornell University and State University New York Centres at Albany, Binghmton, Buffalo and Stony Brook, USA. The congress was held at the picturesque surroundings of Syracuse, New York from August 10-16, 1986. The dates reflect only the official opening and concluding sessions of the congress; the meetings actually started in the morning of Thursday, August 7, when the first batches of scientists left for field trips in central New York to acquaint themselves with the ecosystems of the eastern deciduous forest biome.

The congress which was being held after a lapse of eight years (The III congress scheduled for 1982 in Poland was cancelled) attracted the largest ever gathering of professional ecologists numbering over 2,000 and representing 48 countries. Over 1600 presentations listed in the congress volume came from approximately 2100 authors.

In the opening session some of the speakers highlighted the importance of holding international congresses and their relevance to modern society. The Official opening of the congress started with the messages of welcome by the Chief Executive of Onondage County, Mayor of Syracuse City, Chancellor of the State University of New York and the President of the College of Environmental Science and Forestry. Professor Francois Bourliere of France and the President of the International Congress of Ecology gave an opening address on *Tropical Ecology* and impressed upon the need to develop a free-fiow of information between the scientists working in developed and developing countries. He also emphasized the importance of understanding the tropical ecosystems which have unique species diversity and are important store-houses for germ-plasm on which the future generation will have to depend to a large extent in the coming years. Dr Bourliere felt that there is an immediate need to converse these ecosystems for the posterity.

Summary of the Scientific Contribution by the Delegate

The delegate, D P Zutshi, presented his work under Lake Chemistry session which was presided by Dr C E Asbury. The presentation covered the extent of

* Based on the delegation report of Dr D P Zutshi, Centre of Research for Development, University of Kashmir, Srinagar-6.

man-induced changes in the ecology of Kashmir Valley Lakes (av. alt. 1583 m a.s.l.). The results were presented with the help of 25 coloured slides providing detaild information on various aspects of lake ecology and the extent of environmental degradation induced by different human activities in the catchment area. The paper started with the introduction to evolution of the lakes of Kashmir as a result of past geological processes. The waterbodies have been classified on the basis of water chemistry, thermal behaviour, biological life and the geomorphological featurers of the catchment. The extent of urbanization in recent years was illustrated on the basis of demographic data. Various human based activities including those of agriculture, deforestation, development of infrastructure for tourism and orchard plantation were highlighted. The long-term effects of these activities on the lake ecology was demonstrated. The presentation focussed on the rate of increase in nutrient inputs from the drainage basin, siltation of waterbodies, shrinkage of lake area (open water area) during the last few decades. The data were collected on time-series basis drawing comparisons between the available information and the present studies. The amount of carbon fixation by photosynthetic organisms been reported to have increased by more than 50% during last five years with the predominance of blue-green algae. The most serious ecological changes that have been witnessed in the valley lakes was the increase in the anoxic water column and the release of large quantities of hydrogen sulphide from the hypolimnion zone. This could pose a serious threat to the biological life of the lakes. Some exotic species such as *Salvinia natans*—a free-floating water fern has extensively proliferated during last years and has invaded open water area making aquatic sport and navigation difficult. The progressive increase of *Salvinia* since 1937 was documented. As a consequence of changing environment of the lakes many useful plants have either declined in their number or have completely disappeared. This paper contained detailed information on the conservation of the lake ecosystem that is being adopted by the State Government. During the discussion it was felt that the conservation methods were not adequate and perhaps would'nt be of much help in restoring the ecosystems in order to make them more useful for human based activities-particularly tourism. What was therefore needed was a long-term ecological planning for the lakes which should also include the legal machinery to stop further encroachment of the lake area.

Conclusions arrived at the Congress

The present age has been appropriately designated as the information age. There have been imposing array of breakthroughs in the development of new tools for acquiring and disseminating the information. In a large measure, these developments can be attributed to the changing complexion of research problems, and needs of developed and developing societies of the world, both of which are vastly different from conditions which existed only a few decades ago. New vistas

in the scientific research have been opened up to improve the quality of human life. One of the major problems that confronts modern age is the percolation of the results of scientific research to those areas where it could be immense application and for that what is needed is the transmittance of information. Scientific societies in all disciplines play an important role in the communication of new information, both to and among their own peers, and from the laboratory to the outside world, sometimes referred to as technology transfer. The present congress was able to address itself to this responsibility to a large measure. Because of the limitation of time, travel and availability of funds it becomes difficult to explore the possibility of acquiring the knowledge about the new horizons of scientific research at an individual level or in isolation. Scientific meetings serve this purpose to a greater extent. Scientists have the responsibility of generating new knowledge and to communicate the same to fellow scientists as well as to general public. Many delegates to the congress were of the opinion that the response of many ecological systems to perturbations involves complex interactions among species and between species and their environment. Often these complexities can be analysed only through the use of large complex ecosystem models.

Ecologists have long been accustomed to thinking in terms of organizational hierarchies such as the organism, population and community progression but with the present demands on the natural resources this outlook has to be completely changed to fit into the new problems.

By the year 1980 approximately 11% of the earth's land area and 15% of annual terrestrial energy flux were unavailable to wild species due to clearing of natural areas for cultivation. It has been estimated that there has been extinction of 1-3% of all species of angiosperms, butterflies, land birds and land mammals. Delayed extinction of species whose populations have been reduced below the critical levels are likely; thus human impacts may be more serious than they immediately appear. This demands serious attention of the ecologists.

Results reported at the Congress

The major topics of interest which were covered during various paper reading sessions included the following :

(i) *Agroecosystems* : The results were presented on nutrient and sediment export, carbon budgets and biotechnological aspects in agriculture.

(ii) *Landscape ecology* : It is an interdisciplinary science dealing with the interaction between human society and its living space—its open built-up landscapes. There are three main viewpoints of lands : (a) the visual side (landscape image); (b) landscape as a chlorological agglomerate of land units and (c) lands as a holistic entity vertically as well as chlorologically. Studies using environmental data like

soils, vegetation, water and climate, but also socio-economic political data, was incorporated into landscape ecology. Landscape ecology can be considered as a basic tool for development and regional and physical planning. This field of ecology takes into consideration the total human ecosystem concept.

(iii) *Remote sensing* : Airborne laser profiles have been used to study forest stratification. This area of study was reported in a number of communications.

(iv) *Ecosystem modelling*: A large number of studies reported the dynamial system approach with computer simulation which could prove very useful for optimal environment management strategies.

(v) *Acid precipitation* : During the last few years acidification has become a topic of international interest because of the detrimental effect of the problem on biological communities.

(vi) *Conservation ecology* : A number of papers dealt with the natural resource management and soil water conservation.

(vii) *Pollination ecology* : This is a new field of ecological studies which has great potential for assessing the impacts of chemical pollution in the community structure and reproductive capacities.

(viii) *Ecological genetics* : Extraction of biochemical materials and energy from plants was reported by some of the delegates.

(ix) *Challenge of research on global connectedness* : The recent sudies on global carbon exchange, atmospheric carbon dioxide trends and climate have illustrated how the entire earth system, air chemistry, climate, ocean circulation and terrestrial ecosystems are linked to local human activities such as recovery of fossil carbon, drainage of wetlands and clearing of forests.

(x) *Effect of fire on plant/animal communities* : Many contributions incorporated data on the effects of forest fires on the species composition and structure of biotic communities.

Possible Impact of the Conference on Indian Work

Ecological research work in India has been going on in some universities for the last few decades. The areas which have been covered include forest ecosystems, grasslands and fresh and brackish waters. One of the main limitations with the ecological research in this country has been the lack of laboratory experimentation particularly in the field of aquatic ecology. Facilities for developing laboratory streams for simulating field conditions have been virtually absent or grossly inadequate. In the absence of these experimentations it is difficult to develop hypotheses for

various behavorial attributes of plankton populations. There is no well defined organization looking after the disseminating ecological society except one for tropical ecology. The absence of a spoksman for Indian ecology at the congress was felt by everybody present there. It is time that headaway is made about these shortcomings. It would perhaps be useful to develop inter-institutional projects in India where people from different disciplines would come together and contribute towards the understanding of ecological principles as applicable under our conditions. Research work undertaken so far in this country has been purely an individual efforts.

The Indian participants to the Ecology Congress prepared a draft proposal to convene an International Symposium in October 1987 in Srinagar on the *Restoration of degraded ecosystems : A Global need.* A number of International organizations and many scientists from various countries expressed their willingness to participate in the symposium.

SHORT COMMUNICATIONS

DR K BYRAPPA, Department of Geology, University of Mysore, Manasa Gangotri, Mysore attended the following conferences : a) XVII INTERNATIONAL RARE EARTH RESEARCH CONFERENCE at McMaster University, Hamilton, Ontario, Canada from June 9-12, 1986; and b) VIII INTERNATIONAL CONFERENCE ON CRYSTAL GROWTH at University of York, York, England from July 13-18, 1986. The time gap between the first and the secondcon ference was utilised to visit DSM Research and Patents Ltd., Geleen, Holland, and the Department of Crystallography and Mineralogy, University of Torino, Torino, Italy and delivered special lectures. The delegate also attended the VI World Congress on High Tech Ceramics at Milan, Italy from 24-28, June, 1986, since there was some free time available in between.

The XVII International Rare Earth Research Conference was organised by McMaster University, The American Chemical Society, Moly Corp Inc., Denison Mines Ltd., Ronson Metals Corporation. Over 250 delegates from more than 20 countries attended the conference and more than 200 lectures and posters were presented on various topics like Solid State Structures and Bonding, Organometallic Chemistry, Science and Technology of Intermetallics, Permanent Magnets, Heavy Fermion Metals, Lasers in Rare Earth Spectroscopy, Mixed Valence Compounds, Coordination Chemistry. The conference was inaugurated by Professor L J King, Vice-President, McMaster University with the welcome remarks by Professor J E Greedan (Organising Committee Chairman) and a review of the Technical Programme by W T Carnall. The special feature of the opening ceremony was the presentation of the Frank H Spedding's award to Dr A R Mackintosh and Dr H B Moller for their contribution. Professor Frank H Spedding was born in Hamilton in the year 1902. The Rare Earth Research Conference (RERC) committee established the F H Spedding award in 1979. The fourth award was given in this conference. The plenary lectures were started by the recipients of the F H Spedding award. Both of them presented their work on rare earth elements from the earliest dates. This was followed by the poster session for intermetallics technology. The afternoon Oral Session was divided into two categories : (i) Science and Technology of Intermetallics, and (ii) Spectroscopy. The keynote address of the oral session on the Science and Technology of Intermetallics was given by Professor M D Coey, Trinity College, Dublin, Ireland. He discussed the current view of the intrinsic magnetic properties of the $R_2Fe_{14}B$ series and $R_2Co_{14}B$ series, and the aims and structure of the concerted European Action on Magnets, an unprecedented multidisciplinary

collaboration on iron-rich permanent magnets involving more than fifty laboratories. The keynote address of the Spectroscopy session was given by Professor R S Meltzer, University of Georgia, USA. He discussed the laser spectroscopy of excited state resonances of rare earth ions. Many interesting papers were presented in the poster sessons. Majority of the papers in this conference were on the Solid State Science and Spectroscopy. Also very interesting papers were presented on valence fluctuations. The delegate presented two papers viz., i) *Ionic Conductivity in* Na_3 (R, Me^{3+}) M^{4+} P_3O_{12} *crystals*, and *Hydrothermal Synthesis and Characterization of* $AlPO_4$: *Nd crystals*. Both the papers described some new materials such as Fast Ionic Conductors and Laser Materialsres pectively. The second paper arose a lot of academic interest, particularly with reference to the crystal chemistry of rare earth ions.

Subsequent to this conference, the delegate participated in the International Congress on High Tech Ceramics at Milano, Italy. This was organised by the Ceramic Societies of various countries and other related bodies. Over 700 delegates participated in this congress from various countries. Papers and Posters on various aspects of Preparation and Characterization of Ceramic in different technological fields like microelectronics, electronics, and telecommunication, piezoelectric, solid electrolytes, etc. were presented. The general invited papers like *New Ceramics : A stratgic view*, *Ceramics in Microelectronics*, *Applications of Ceramic Electrolytes in Electrochemical Engineering System*, etc. were very good. After this Congress, the delegate worked in the DSM Research and Patents, Geleen, Holland to get aquainted with the recent analytical techniques and equipment for a systematic characterization of materials. The delegate also delivered a special lecture to the staff of DSM on the synthesis of some industrial phosphates.

Subsequent to this, the delegate attended the VIII International Conference on Crystal Growth University of York, York, England from July 13-18 1986. Here the delegate presented two papers entitled : *Synthesis and Characterization of a New Polymorphic Modifiction of* $AlPO_4$ *and Synthesis and Characterization of New Supersonic Triorthophosphates*. This conference was sponsored by the British Association for Crystal Growth under the auspices of the International Organisation for Crystal Growth and the conference was supported by various national and international bodies. Over 500 delegates from more than 30 countries attended this conference and more than 400 papers and posters were presented. The conference was inaugurated by the President of the International Organization for Crystal Growth, Professor R Kern and the opening address was delivered by Dr Derek Roberts, Deputy Managing Director, General Electric Company, UK. The first plenary lecture was given by Professor B L H Wilson, Plessey Research (Caswell) Ltd., UK. He discussed the controlled Crystal Growth to meet the semi-conductor industry. He remarked the advantages in cost and

optoelectronic integration can stem from the growth of GaAs on Silicon. Crystal Growth techniques must overcome the 4% lattice mismatch and antiphase domains arising from double positioning. The conference was well organized and was a great success. The sessions of the entire conference were divided into two categories : General Sessions and Symposia. Both the categories included papers on Hydrothermal, Solution and Gel Growth, Thermodynamics, Chemical Vapour Transport and Vacuum Deposition, Melt Growth, Kinetics and Morphology, etc. Numerous papers were presented on Semi-conductor materials and Optical Materials. A complete day was assigned to each one of these fields. The most interesting part of the conference was the screening of the films on the *in situ* observation of crystal growth, by Japanese and Bulgarian participants, and also a movie on the crystal growth activities in space lab by NASA, USA. There was an exhibition of equipment by many companies. Also some of the manufacturers had displayed their commercially available crystals. China had sent a fairly big delegation to this conference. Professor Jiang Minhua of the Institute of Crystal Materials, Shandong University, Jinan, China gave a general lecture on the Crystal Growth Research in China. He discussed the chinese ancient crystal growth to the modern crystal growth research which starts from 1950's.

In general the ICCG-86, emphasized on the need for the growth of high quality crystals, particularly for semi-conductors, electrooptic devices, etc. Also the proper understanding of the crystal growth process in the zero gravity.

DR P K MAITRA, Molecular Biology Unit, TIFR, Bombay participated in THE VI FAOB CONGRESS held at Singapore from November 29 to December 5, 1986. It had five plenary lecturers. Joseph Goldstein gave a most remarkable lecture on the *Role of IDL receptors in mutant human subjects prone to heart dsseases.* They had isolated the receptor gene that is responsible for the endocytotic internalisation of circulating cholesterol. The receptor gene is about 20 kilobase long, has 18 introns and the protein which spans the membrane has as many as four distinct domains. The mutant receptors studied included mutations leading to attenuated synthesis of normal receptors or faults in the protein either through point mutations or internal deletions of different lengths. A rabbit system with the LDL-receptor defect is now being studied at the level of insertion of *in vitro* mutagenised gene for possible therapeutic models. David Baltimore talked about the regulation of immunoglobulin gene shuffling by an octanucleotide sequence lying upstream to the TATA box and a trans acting protein that interacts with the sequence providing tissue-specific regulation. Yasutomi Nishizuka outlined the various likely targets in the action of protein kinase C, particularly in regard to the mode by which this enzyme, by mobilising cellular Ca^{++} ions, modulates not only ongoing metabolic fluxes but also differential gene expression in nerve cells. This led to the suggestion that protein kinase C may

play a significant role in the plasticity displayed by neuronal systems. The other speakers in the plenary sessions were Peter Mitchell (*Transport proceses mediated by mobile carriers and mobile barriers*) and Choh Hao Li (*A segment of a peptide hormone antagonises the hormone action*).

The plenary lectures were followed by more than a dozen symposia on subjects ranging from proteins and enzymes to applied aspects of biochemistry. Alexander Rich summarised recent work from his laboratory that points to the possibility of the existence of proteins which facilitate the normal slow equilibration between the right-handed B-DNA to the left-handed Z-DNA. He also outlined a model of genetic recombination based on the unique structural features of Z-DNA. C Ronald Kahn gave a lecture on insulin receptors and how they are altered in diabetes and related diseases. George Todaro discussed the distinctive features that distinguish the tumour growth factors from epidermal growth factor despite many common characteristics. T L Blundell illustrated his talk on structural evidence for gene duplication in evolution of proteins with beautifully coloured slides of protein structure generated by computer graphics. He made the point that X-ray reveals aspects of structural similarity in proteins not always shown by their primary amino acid sequence.

The other welcoming feature in the IV FAOB congress was a number of sessions given to technological advances in modern biochemistry. A talk by Charles Cantor on pulsed field gel electrophoresis in the analysis of large DNA illustrated the power of this method in the analysis of single human chromosomes. It was perhaps no coincidence that one manufacturer was displaying the wares for this electrophoretic technique in a neighbouring room in the venue of the scientific trade exhibition. Among other items covered in the technology sessions were : newer applications of HPLC and modern methods for DNA and protein sequencing.

The congress was attended by 700 delegates from 30 countries. Those from India constituted about 10%. The delegate spoke on the Genetics of Yeast Phosphofructokinase. Unlike mutations in other glycolytic enzymes those affecting fructose 6-P kinase in *Saccharomyces cerevisiae* leave it practically unaffected in growth on sugars. This is because this organism possesses a second enzyme that catalyses the same reaction. This isozyme of phosphofructokinase is distinct from the classical enzyme in several respects. It is membrane-bound and is present only during growth on sugars. The enzyme activity is not inhibited by ATP or fructose 1,6 bisphosphate nor stimulated by fructose 2,6 bisphosphate. It is inactive without NH_4^+ ions which convert the saturation profile of the enzyme with fructose 6-P from sigmoidal to hyperbolic. Mutations causing loss of the particulate enzyme belong to at least four complementation groups, one of which, namely *PFK2* plays a dual role. This gene product determines the catalytic function of the particulate enzyme and in addition, regulation of the soluble phosphofructokinase by ATP.

DR V PANCHAPAKESAN, Associate Professor, Department of Earth Sciences, IIT, Bombay participated in the VIII MEET OF INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (IAGOD) held at Lulea, Sweden from August 18-22, 1986. IAGOD was established and affiliated to the International Union of Geological Sciences (IUGS) at New Delhi in 1964. Symposia are arranged every four years by the association.

Abstracts of 174 contributed papers were published in *Terra Cognita* (Vol. **6**, 1986). An additional four late papers and posters were abstracted in a separate booklet.

The topics of deliberations included Tectonics of Ore Deposits, Paragenesis, Ore Forming Fluids in Inclusions, Fluorite and Barite Deposits, Skarn Deposits, Manganese, Tin and Tungsten Deposits, Gold Occurrences in Precambrian Shield Areas, Massive Sulphide Deposits in Volcanic Environments, Mineralization Associated with Granitoids and other unclassified areas. There was an additional topic on the Nordkalott Geology and Mineral Deposits-a Cartographic Synthesis. Several interesting papers were presented in the eleven topics spread over in these parallel sessions. The topic of 'Tectonics of Ore deposits' included certain interesting papers on subjects such as the tectonic settings of mineralization in South China, structural developments in Arabian shield etc. In addition to regional emphasis, several papers were global interest. A paper was on the Tectono—lithologic evolution of the north Singhbhum Mobile belt of India and associated Mineralization. Interesting aspects of the Paragenetic Sequence were lucidly brought out under another topic. The topic on Ore forming fluids in inclusions made a collective contribution on different deposits from several regions such as Saudi Arabia, Sweden, USA, India, Germany, Norway, Japan and China. Limited papers on fluorites and barites, maganese, Skarn and Tin-Tungston deposits were presented. A case study of the Central Indian Shield in regard to Tin-Tungston mineralization was also reported.

Large number of papers stimulated discussion on Gold Mineralization in Precambrian Shields, Massive Sulphides and Granitoid associations. Key note paper of Dr K W Hutchinson on Metallogeny of Precambrian gold deposits—space and time relationship and a contributed paper by Groves et al. on the Regional Techtonic Controls on the distribution of large Archaean gold deposits were very informative. There were two papers on gold mineralization in the Indian shield.

Papers presented in the symposium covered a wide range of subjects in the area of Ore Genesis. New areas of research have been opened up in all these topics and the contributions from scientists from various parts of the world have enabled the scientific community to collectively consider the multifaceted aspects of problems relating to ore genesis.

The outcome of the conference will be perceptible when the papers in full form are published and made available to all the Indian Geoscientists. New ideas

generated can enable the Indian geoscientists to have a fresh look at the various aspects mineralisation, particularly in relation to gold, base metal sulphides, tectonic influence and mineralisation associated with granites. Fluid inclusion and ore solution chemistry, discussed during the symposium will certainly enable graphic details of the ore deposit environment to be integrated with the ore fluid parametres.

Discussions held with fellow delegates have shown that new areas of thrust can be identified and global, regional or local collaborative programmes may be undertaken. As a follow up, Indian members of TAGOD can form a team and carry out an integrated attempt towards data collection and analysis of various metallogenic episodes and provinces within the country.

DR G THYAGARAJAN, Director, Central Leather Research Institute (CSIR), Adyar, Madras-600 020 participated in The VI INTERNATIONAL CONGRESS OF PESTICIDE CHEMISTRY at Ottawa Canada from August 10-15, 1986. The congress was attended by over 1200 participants from 37 countries. In view of the commercial importance and significance of the pesticides, this congress is generally largely attended by participants came from academic, industrial and governmental R & D organisations. Two plenary lectures were delivered, one by Dr H Geissbuehler of Ciba-Geigy, Basel, Switzerland on *Reflections on the future of chemical plant protection research* and the other by Dr E G Jaworski of Monsanto Chemical Company, USA on *Impact of biotechnology on agricultural pesticides.* The scientific programme considered of eight symposia:

(a) Synthesis of pesticides and bioregulators,

(b) Chemistry and bioactivity of natural products and prototypes,

(c) Chemical and biological basis of pesticide activity and resistance,

(d) Progress and development in formulation chemistry and technology,

(e) Pesticide residue and methodology,

(f) Environmental fate effects,

(g) Metabolism in plants and animals and

(h) Pesticide toxicology and human health and two special symposia

  (i) Collaborative methods and

  (ii) Biotechnology.

The structure-activity relationships for design of pesticide molecules received emphasis. It was clear that newly emerging bioactive compounds are increasingly

chemically complex and demand intricate handling in view of chirality, asymmetric centres and associated structural complexities (75% of all bioactive compounds are chiral). Several important papers dealt with advances in understanding insecticide modes of action and, in general, the chemical-biological basis of pesticide activity and resistance. In the area of perticide residue methodology the papers presented revealed an increasing trend towards mass and GC–mass spectrometry, immunoassay (ppb level) and high performance liquid chromatographic electrochemical techniques. Data management in the pesticide laboratories is being made easy and convenient through personal computers and laboratory information management systems (LIMS). The problems, implications and progress on environmental fate effects received significant attention and papers presented related to environmental screening models, translocation problems, photoinduced transformations, environmental aquatic photochemistry, quantification of pesticide losses by leaching and run-off and pesticide eco-toxicology.

In every congress on this subject regulatory decision-making is an important discussion topic and this congress was no exception. A Forum on Regulatory Decision Making : Problems and Prospects" introduced papers entirely from USA and discussed the strengths and weakness of the system.

The advent of biotechnology and its significance as well as implications to pesticides and pest control were highlighted in a special symposium. Technical hurdles in plant genetic engineering were cited as : (a) identification of agronomically important genes (b) cell transformation systems (c) gene structure and function and (d) plant breeding. In the USA, the US Department of Agriculture has identified biotechnology as a high priority area and is funding 100 post doctoral research schemes relating to isolation and characterisation of bacteria (that degrade xenobiotics), characterisation of genes and improved enzyme delivery systems.

Possible Impact of the Conference

The indigenous base of pesticide manufacture is very strong, thanks to many technologies successfully and efficiently developed and to industry transferred by the CSIR laboratories in Jorhat, Hyderabad and Pune. However, basic research in pesticide chemistry is not commensurate with the needs and available talent in the country. It will be very useful if the INSA could constitute a special group of experts to take stock of our achievements, needs and problems and identify research opportunities and researchers whose work could be organised in a coordinated manner. Thousands of interesting and novel molecules synthesised in the academic institutions in the country, under CSIR and UGC supported research schemes have not been pursued for further research leads. Many of them are being exploited outside the country, thus depriving our own scientists of potentially direct contributions to new pesticide research. There is a lot of scope for organising pesticide chemistry research systematically in our country.

DR UTPALA CHATTOPADHYAY, Assistant Director and Head of the Department of Tumorimmunobiology, Chittarajan National Research Centre, 37, S PMukherjee Road, Calcutta-700026 participated in the VI INTERNATIONAL CONGRESS OF IMMUNOLOGY from July 6-11, 1986 at Toronto, Canada. This international congress was sponsored by the International Union of Immunological Societies and the Canadian Society for Immunology and the National Research Council of Canada. The congress was well attended by delegates from all over the world as well as from the host country and the total number of registered delegates was around 6000. The opening Plenary Lecture was delivered by G S V Nossal from Australia. Dr Nossal has been able to establish single cell clones of splenic B cells capable of producing antibodies without the intervention of any other types of cells.

The principal theme of the congress covered the following topics : Developmental Biology of the Immune system; Structure and Function of Recognition Structures; Regulation of the Immune Response; Oncogenic and immunological Aspects of Chromosomal Translocations in Man, Mice and Rats; Specificity and Antigenicity and Transplantation Immunology; B cell and T cell subsets; Cymphokines and Growth factors. The basic and applied aspects of immunology were covered in more than hundred lectures delivered in different symposia.

Major attention was given to the recent observations on interleukins and the regulatory mechanisms of immunocompetent cells. The presentations of G Klein of Karolinska Institute, Stockholm; B Bencerraf of Harvard Medical School, Boston; R C Gallo of National Cancer Institute, Bethesda and L Chedid of Institut Pasteur Paris were most interesting.

Delegate's Contribution

The interaction of the macrophages and the tumor cells to be cytolysed depends on the recognition sites on the cell surfaces. Some monosaccharide molecules play an important role in this target-specific recognition of tumor cells by the macrophages. The present investigation used the radiolabelled Cromium release assay to measure the tumor cell killing activity of the tumor associated macrophages isolated from tumor bearing swiss mice and studied the role of simple sugars in the killing machanism. The molecules tested were glucose, mannose, X-acetyl glucosarine, N-acetylglucosamine and N-acetylgalactosamine at different concentrations. Only glucose at a higher concentration showed marginal increase in antibody dependent cytotoxicity. The sugar affected the target binding and lysis by the tumor associated macrophages differentially. The results indicated involvement of sugar binding 'lectin like' receptors on the surface of macrophages that may participate in the killing of tumor cells.

Involvement of the above type of receptors in the macrophage mediated cytotoricity was a point of great interest and discussion at the Congress. In response to questions, the present delegate explained the elegance of the test system and the wide

scope of further work on the characterisation of the receptor sites. A few eminent immunologists expressed interest in the future work to be carried out with special reference to possible modulation of the activity of the tumor associated microphages with small molecular weight compounds having structural analogy with the sugar molecules tested so far.

Experience of the congress will be beneficial for research work in immunology in India. The knowledge acquired in the congress will be amplified through several hours of discussion with a number of young workers engaged in immunological research. The effect of Inter-leukin 2 and the activated killer cells on regulation of tumor growth needed critical attention for research workers in India to work in this area.

Receptors of different lymphocyte subsets and their involvement in immunoloregulation is another aspect of research which will also get reinforcement as a consequence of the immunology congress. Research in areas, such as, monoclonal antibody for diagnostic purpose, genetic recombinant studies for preparation of lymphokines and studies on oncogene will also get stimulated from the congress.

DR HANS RAJ, Senior Research Fellow, DST Centre for Visceral Mechanism, FV Chest Institute, University of Delhi Participated in the XXX International Union of Physiological Sciences (IUPS) Congress at Vancouver, Canada. The IUPS holds an international congress oncein three years. The programme was extensive covering almost all the fields of Physiology. Symposia and poster sessions were held on thirty two themes and there were about 65 invited lectures by some of the eminent physiologists from all over the world. Following sessions were of great relevance to the delegate.

Cherniack spoke on coordination of motor output to upper airways and pumping muscles. It may be that upper airways and pumping muscles are driven by the same or different but closely interconnected pattern generators. Stimulation of vagal receptors in lung do affect the upper airway and chest wall muscles. Respiratory control thus involves the integration of both upper airway and chest wall muscles.

C von Euler introduced the new and rapidly progressing field concerning the functional roles of various neuropeptides in the different control mechanisms for pattern generation, pattern formation, chemoreception and drive integration.

Sears spoke about synergy in heirarchial levels of control of respiration. The highest level, under voluntary control, provides the motive force for expressing emotions through "speech" and "song", while at the lowest level the automatic respiratory movements occur both in awake or in sleep without intruding on the conciousness. Between these two states is a series of motor synergies such as coughing, sneezing and other postural related activities. Presently research focusses on the central

mechanisms of such acts which reflect a complementary influence of central neuronal activities on specific spatio temporal pattern of respiratory motoneurone activities.

There has been ongoing research in hypoxia and regulation of breathing all over the world. There were many physiologists from China and Japan who presented their work. S T Hu found in his studies that it is the peripheral chemoreceptors which are responsible for hypoxic ventilatory drive and acclimatization to high altitude.

There was a poster from Cassidy group confirming muscular inhibition following J receptor stimulation (J reflex). But they also observed the same with lung inflation which produced its effect by stimulating the same receptors.

Noble laureate Sir J C Eccles reviewed synaptic transmission in the central nervous system and said that the new field of microsynaptology may give insight into the mind-brain problem on analogy with the probability fields of quantum mechanics.

Torebjork gave the Adrian-Zotterman lecture on cutaneous sensation. He combined microneurographic recordings from single sensory units in intact human nerves with intraneural electrical microstimulation of these identified single sensory units. The results indicated that stimulation of single mechanoreceptor units with myelinated fibres evoked specific qualities of sensation which were typical for unit type. Furthermore, changing the pattern of stimulation of a single sensory unit did not change the basic quality of sensation.

Scientific Contribution by the Delegate

A poster entitled *Sensations Produced by J Receptors* was presented in the session on Control of Breathing. The aim was to provide an evidence to prove that J receptor stimulation produces breathlessness. The study was conducted on twenty male volunteers and ten patients of chronic obstructive pulmonary disease. Threshold dose of lobeline hydrochloride (an agent which is known to stimulate J receptors when injected intravenously) to produce sensations and cough were determined and found to be 14.9 μg/kg (S.E. $\pm$ 1.1) and 27.5 μg/kg (S.E. $\pm$ 3 4) respectively. The interesting results were that moderately severe exercise on bicycle ergometer resulted in a significant increase in the mean threshold dose from 13.4 to 20.5 μg/kg for sensations and from 25.7 to 32.1 μg/kg for cough. The COPD patients did not perceive sensations until the cough threshold. Cough threshold was found to be significantly higher in ten moderate smokers. The mechanisms involved were discussd.

Nature of sensations felt by the subjects were described to be as irritation, tickling. fumes, choking, suffocation and tightness in chest and difficulty in breathing. Six normal subjects reported that sensations resembled those generated during moderate exercise.

The poster was well received and it was a step further to strengthen the concept of sensation of breathlessness being produced by J receptors during exercise and disease.

Recommendations/Conclusions

Genesis of "Dyspnoea" is regarded as multifactorial and J receptors are not given their due place in its causation. More work on these receptors, especially on patients in clinical situations, should be undertaken so that attempts could be made to alleviate the distressing symptom of breathlessness in so many conditions.

Impact of the Present Conference on Research in India

The discovery of J receptors has great significance in the field of High Atitude Physiology and Chest Medicine. But precious little seems to have been done in the clinical set up in this regard.

Symptoms of breathlessness, cough and muscular weakness in high altitude pulmonary oedema and in victims of Bhopal gas tragedy could easily be explained by J receptor stimulation.

Research on J receptors and hypoxia should be undertaken seriously as stimulation of these receptors in chronic pulmonary diseases, which have a high incidence lead to disabling symptoms limiting manpower. Furthermore, certain individuals may have weak response to their J receptor stimulation, consequently they keep exercising or climbing at high altitude till they get pulmonary oedema. This has been a big problem facing our army defending Himalayas. Research may help screen the population to pick up susceptible individuals at sea level.

DR P RAMASAMY, Professor of Physies, Crystal Growth Centre, Anna University, Madras-600025 participated in the VIII INTERNATIONAL CONFERENCE ON CRYSTAL GROWTH at University of York, York, England from July 13-18, 1986. Opening address was delivered by Dr D H Roberts, CBE, FRS, Research Director, GEC followed by the first plenary lecture on *Crystal Growth for the Electronics Industry* by Dr B L H Wilson.There were two parallel sessions going on during the entire period of the conference. one was a "Symposia" and the other "General Session". The symposia were on topics such as (a) Heat and Mass Transport in Earth and Micro-gravity, (b) Melt Growth Technology, (c) Casting and Rapid Solidification, (d) Optical Materials and ,e) Low Dimensional Structures.

The topics covered under the general sessions were classified as : (a) Hydrothermal, Solution and Gel Growth, (b) Metal Films, (c) Chemical Vapour Transport and Vacuum Deposition Characterisation, (d) Thermodynamics, (e) Industrial Crystallisation, (f) Cells and Eutectics, (g) Kinetics and Morphology, (h) Solid State, (i) Flux

and High Temperature Solution Growth, (j) Diamond, (k) Nucleation and (l) Novel Materials and Techniques. The conference proceedings is to be brought up as a special issue in the Journal of Crystal Growth. On the first day a meeting of the National Crystal Growth Association was held and it was followed by the International Organisation for Crystal Growth Executive Meeting. Over the second day there was a Council Assembly of IOCG.

Much of the reported crystal growth activity was on III-V compounds and one of the highlights of the conference was the display of large sizc dislocation free Gallium Arsenide crystal, used in high technology. Equally important was the industrial collaboration with the scientific community and the reported technical advancements by the equipment manufacturing firms. Much attention was paid to the growing activity such as multiple pass zone refining/levelling, MOCVD, and epitaxy.

The delegate was elected as a member of the Executive Committee for IOCG. It was announced that the next International Conference on Crystal Growth will be held at Sendai, 300 KMS away from Tokyo in Japan during August 20-25, 1989.

MS S SEETHA, Technical Physics Division, ISRO Satellite Centre, Airport Road, Vimanapura P. O, Bangalore-560017 attended the INTERNATIONAL ASTRONOMICAL UNION COLLOQUIUM NO. 93 on CATACLYSMIC VARIABLES at Hamberg from June 16-19, 1986. The Colloquim No. 93 on Cataclysmic Variables mainly dealt with the current status of observations and theory of these objects and a few results on specific objects were presented. The participants included B Warner who gave the introductory lecture and many other famous astronomers from various countries like A V Tutukov, H Ritter, G Chanmugam, J O Patterson, G R Bath, G Shaviv, S Starfield, J Smak, D Q Lamb, M S Cropper, K Beuermann etc. From the technical physics division of ISRO Satellite Centre contributed two papers were of which one had to be presented as a poster due to shortage of time for contributed talks. The paper was on E X Hydrae, a well known intermediate polar with a 98.3 minute eclipsing period and a 67 minute rotational period. It is a binary system consisting of a white dwarf accreting mass from a red dwarf. As part of the results the existence of the 46.3 min. period which has been reported earlier by only one publication (Cordova et al. MNRAS, 212, 447) was confirmed.

New periods at 34.7 minute and 26.7 minute were reported. The 46.3 minute and 34.7 minute period can be explained as the beat of a 0.58 day, probably precessional period of the disc and the second harmonic of orbital and second harmonic of rotational period respectively. The 26.7 minute period could be the beat of the 67 min. and 46.3 min periods. There is however no confirmation as yet of the 0.58 day period which will require long term X-ray and optical observations.

The second paper which was presented as a poster paper was on AM Canum Venaticorum. This twin white dwarf which has a high mass ratio has evoked a considerable interest lately because of the discrepancy between the theoretical expected rate of change of period and the observed period change of the 1051 sec period observed in this system. Two flares were reported by this delegate group which were of a 0.34 and 1.1 magnitude increase in white light. The data were obtained in February, March 1985 and February 1986 using the 1 metre reflector at the Vainu Bappu Observatory at Kavalur using a flat response GaAs phototube. It is found that the activity state of this object is high. The flares lasting for 200s is followed by typical photometric features of AM CVn ruling out instrumental or extraneous effects. Presentation of this poster in this meeting provided an opportunity for other famous astronomers, to look at the data and enabled for clarifications and explanation, in person, of the counting system used by us. The general opinion of the scientists was that since this object is not exhibiting properties which are predicted by theory, new models might have to be evolved after longer stretches of data is obtained. This will have to be done next year as this object is available of observation in Feb-April season. It is worth mentioning here that this object forms one of the few systems which may form part of the late evolutionary track of binaries.

This system has a 1051 sec period which until recently was thought to be the orbital period, but now can be explained as the rotational period of mass accreting magnetised white dwarf. The 1051 sec period is found to indicate a decreasing trend. There was another poster on this very same object by J E Solheim and O K Moe, based on UV spectral data of IUE during 1978-1983. The spectral features of CIV lines also indicate varying profiles changing within a few hours. It also indicates a P cygni type of profile which may indicate a stellar wind from the system. However, it is very difficult to explain stellar wind features from a system consisting of degenerate stars. The calculation and nature of period change for this system was discussed with the previous authors Dr J E Solheim and professor E L Robinson. They agreed about the analysis and concluded that this object will need longer observation runs. If one could get observation time on almost simultaneous dates at different observatories around world this would result in an almost continuous data train to search for longer periods.

In connection with the above two objects, it would be appropriate to mention here the results presented on TT Ari (Another intermediate polar) by Semeniuk et al. They find a period in this system around 10 minutes by combining data from 1961 to 1985. This period however cannot be confirmed as a rotational period because it changes from 27 min in 1961 to 17 min in 1985. In addition this system exhibits a 3.2 hr photometric period which is decreasing, a 3.3 hr spectroscopic period and a 4 day beat of the two. Hudec et al. report in addition quasi. periodic oscillations at 10 $\pm$ 5 min. and fast periodicities at 9.6s and 18.3s with millimagnitude variations. The day-to-day variation of this object is found to be 0.1 to 0.2 mag in B filter. There is no obvious modulation in X-rays.

There were X-ray results of period presented on many other objects like H2252-035, 4U 0115 + 63, Ex 02030 + 37 etc. The impact of attending such conference is multifold. A researcher in India is then exposed to other research workers and their systems, instruments and analysis techniques. It would also give an opportunity to give a better exposure of the results to the persons who are involved in the field. Since reports and papers do not explain every aspect clearly, meeting a research worker in person enables others to understand the capabilities and facilities available at any particular laboratory/observatory or organisation. Other research workers have been able to understand our equipment and data collection capability and therefore understand the results better. Any clarifications in this respect can be cleared in person.

Since long-term studies are necessary on any object, the kind of understanding about system capabilities will enable research workers in India to be included in world wide campaigns for observation. For example. in future it would be possible that the observation time at Kavalur will be used for coordinated observations on the object of AM CVn along with observations from other observatories.

Forthcoming Seminars/Symposia/Conferences etc.

IAHS/IUGG Sponsored International Conference on History of Hydrology at Rome, Italy from April 6-10, 1987.

IUPAC Sponsored CHEMRAWN VI; World Conference on Advance Materials Needed for Innovations : Energy, Transportation and Communications at Tokyo, Japan from May 17-22, 1987.

IAU Sponsored International Conference on Mapping the Sky-Past Heritage and Future Directions at Paris, France from June 1-5, 1987.

IUPAC Sponsored International Symposium on Macromolecules-Small Angle Scattering and Related Methods at Prague, Czechoslovakia from July 13-16, 1987.

XXXI IUPAC Congress at Sofia, Bulgaria from July 13-18, 1987.

IUPAC Sponsored XXV International Conference on Coordination Chemistry at Nanjing, China from July 26-31, 1987.

IUBS Sponsored XIV International Botanical Congress at West Berlin from July 24 to August 1, 1987.

IUCr Sponsored International Symposium on Neutron Scattering at Lucas Heighst, Australia from August 5-8, 1987.

IUMS Sponsored VII International Congress of Virology at Edmonton, Canada from August 9-15, 1987.

XIX General Assembly of IUGG at Vancouver, Canada from August 9-22, 1987,

IUCr XIV General assembly and International Congress at Perth, Australia from August 12-20, 1987.

International Science News & INSA Delegation Reports

Vol 5 No 2 April 1987

CONTENTS

		Page
XXVI COSPAR Meeting	S Biswas S Sampath	1
XIV International Cancer Congress	S V Bhide	14
IAU Symposium on Circumstellar Matter	U C Joshi	18
IAU Colloquium on Physics of Be Stars	G C Kilambi	23
IGCP-IGBA Meeting on Igneous Data Bases	K V Subbarao	29
International Conference on Precision Electromagnetic Measurements-86	P C Kothari	33
XXX International Congress of Physiological Science	A Aleem	38
International Congress of Ecology	D P Zutshi	44

SHORT COMMUNICATIONS

XVII International Rare Earth Research Conference, (Ontario, Canada) and VIII International Conference on Crystal Growth, New York, USA (K Byrappa); IV FAOB Congress, Singapore (P K Maitra); VIII International Association on the Genesis of Ore Deposits, Sweden (V Panchapakeshan); VI International Congress of Pesticide Chemistry, Ottawa, Canada (G Thyagarajan); VI International Congress of Immunology, Toronto, Canada (Utpala Chattopadhyay); XXX International Union of Physiological Sciences (IUPS) Congress, Vancouver, Canada (Hans Raj); VII International Conference on Crystal Growth, York, England (P Ramaswamy); International Astronomical Union Colloquium No. 93 on Cataclysmic Variables, Hamberg, West Germany (S Seetha).